27/21

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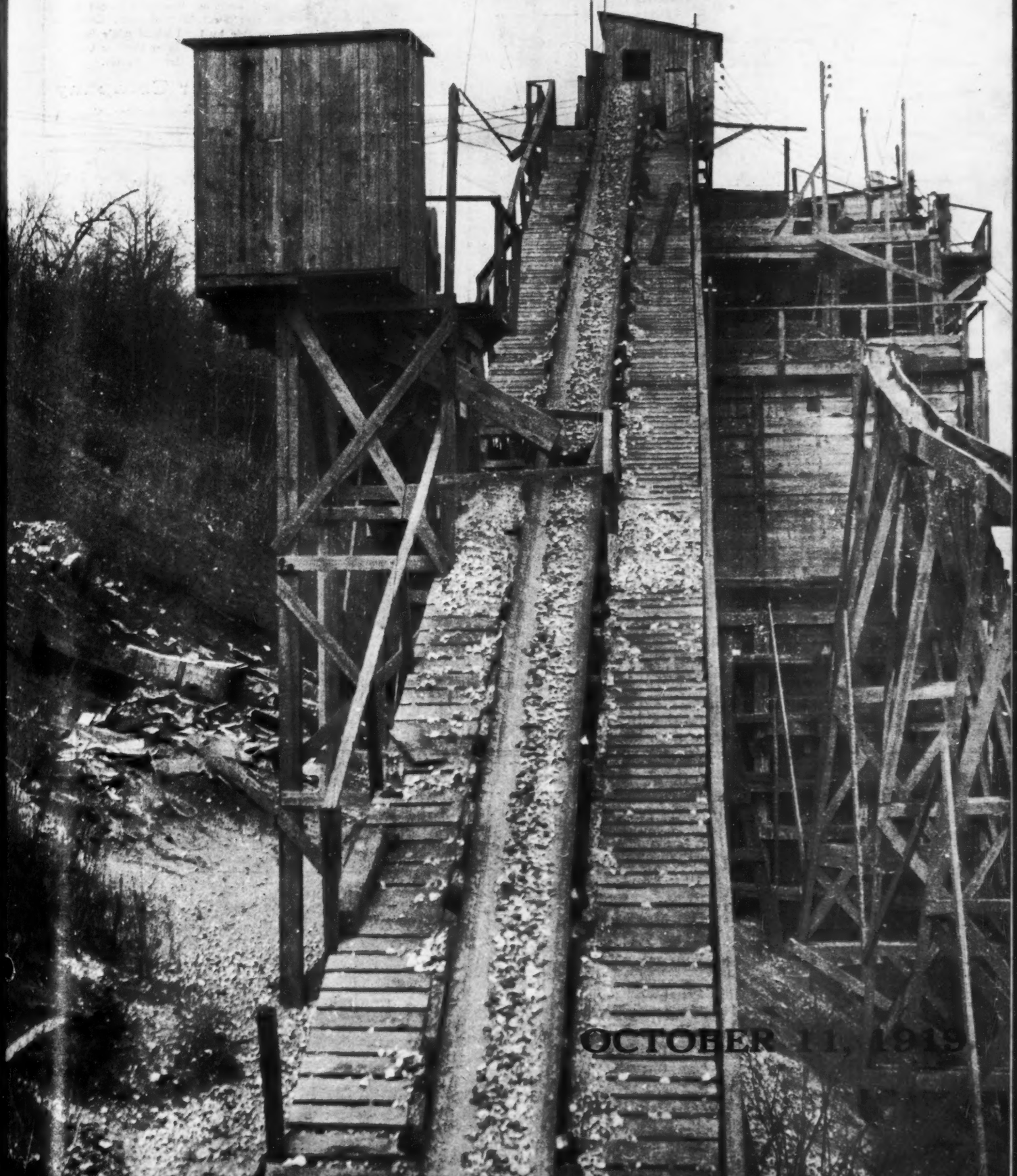
Rock Products



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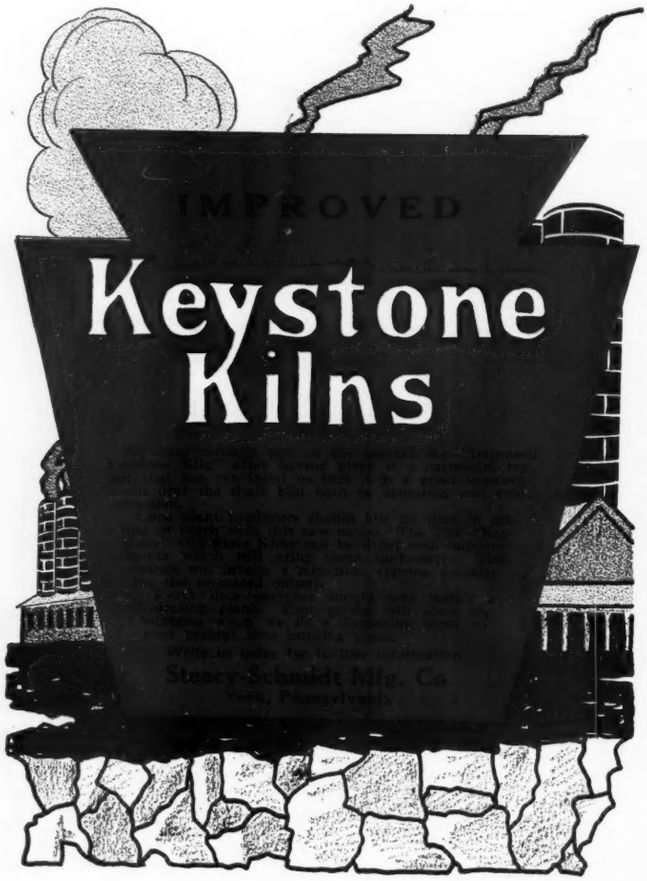
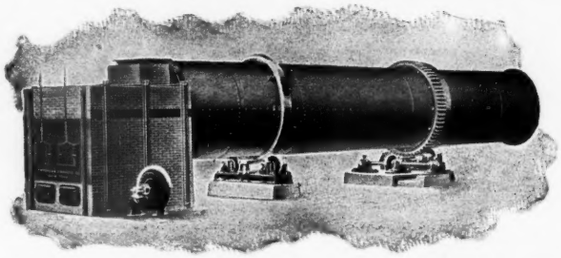


"PENNSYLVANIA"
Hammer Crushers

For Crushing and Pulverizing Lime, Limestone, Gypsum, Marl, Shale, Etc. Main Frame of Steel, "Ball and Socket" Self Aligning Bearings; forged Steel Shaft; Steel Wear Liners; Cage adjustable by hand wheel while Crusher is running. No other hammer Crusher has such a big Safety Factor.

PATENTED
Pennsylvania Crusher Company
New York PHILADELPHIA Pittsburgh

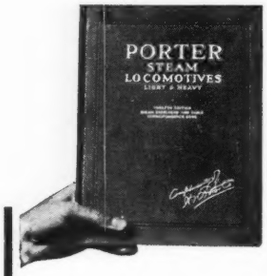


DRYERS
AMERICAN PROCESS CO. 68 Williams Street NEW YORK CITY

ATTENTION
Cement Manufacturers and Supply Dealers

Some of our customers who are using our Puncture and Waterproof bags report one-third increased sales to their satisfied customers. Also report breakage for 1917 and 1918 from all causes only one-half of one per cent.

THE JAITE CO.
JAITE, OHIO
Sole Manufacturers

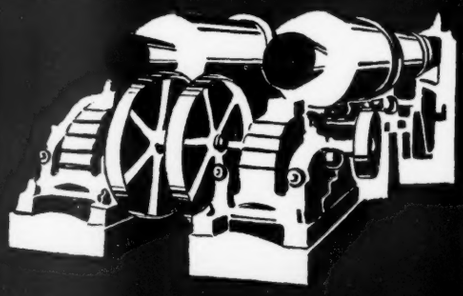


PORTER
Locomotives
For Contractors' Use

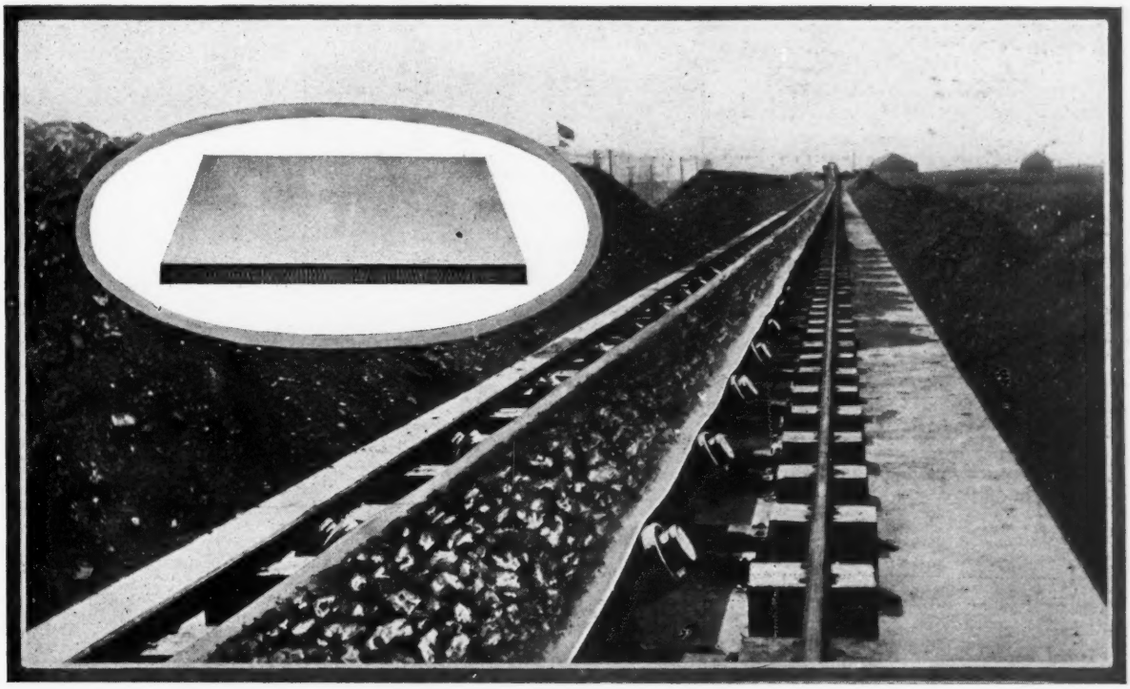
Send your locomotive problems to us for solution. Our fifty years of experience will be invaluable to you in selecting the best possible locomotives for your particular line of work.

Our complete catalogue of steam locomotives is free to prospective users.

H.K. Porter Company, Pittsburgh, Pa.



RUGGLES-COLES
DRYERS



You are invited to write us fully on your requirements, and complete information, with prices and samples, will be cheerfully furnished.

Getting the Utmost From Your Conveyors

The factor that makes for economical operation of your conveying systems and that keeps them on a profitable basis is the use of the right kind of belting.

The steady flow of the material to the point of delivery and the faithful performance of the belt, month in and month out, with the least amount of attention, is typical of Indestructible Conveyor Belting installations.

Its construction is worthy of your careful study.

It has great strength to carry full loads with a wide margin of safety—

Flexibility to conform perfectly to the shape of the carrying rollers—

A rubber cover of a tough stock to resist abrasion—and—

Rubber friction uniting the plies of duck that is particularly strong and tenacious.

If you want a super-belt to work for you, put on Indestructible. It means the lowest cost per ton of material carried.

NEW YORK BELTING & PACKING CO.

Makers of Belting Since 1846

New York Boston Chicago Philadelphia Pittsburgh St. Louis San Francisco

INDESTRUCTIBLE CONVEYOR BELTING

Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor GEORGE P. MILLER, Manager C. F. TREFZ, Associate Editor

Vol. XXII, No. 21 October 11, 1919

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Entered as second class matter July 2, 1907, at the Postoffice at Chicago; under act of March 3, 1879.

The SOURCE
The MACHINE
The DESTINATION

The source is a solid rock cliff. The machine is a Traylor "Bulldog" Gyratory Crusher. The product is crushed rock. The output is from 25 to 3,000 tons per hour. The destination is better roads at lower cost and exact profit, based on economical production methods.

Scientific construction, based on years of experiment and experience, enter into Traylor "Bulldog" Crushers. Whatever the requirements, small or big, turn a "Bulldog" loose on the job and operations are going to show "life." The kind that produce big results.

"Bulldog" Gyratory Crushers have a shaft that is much shorter and 100% stronger than standard gyratory shafts—an eccentric that is both longer and of greater diameter than others—and a positive force-feed lubricating system — all features that make for increased production with decreased power consumption.

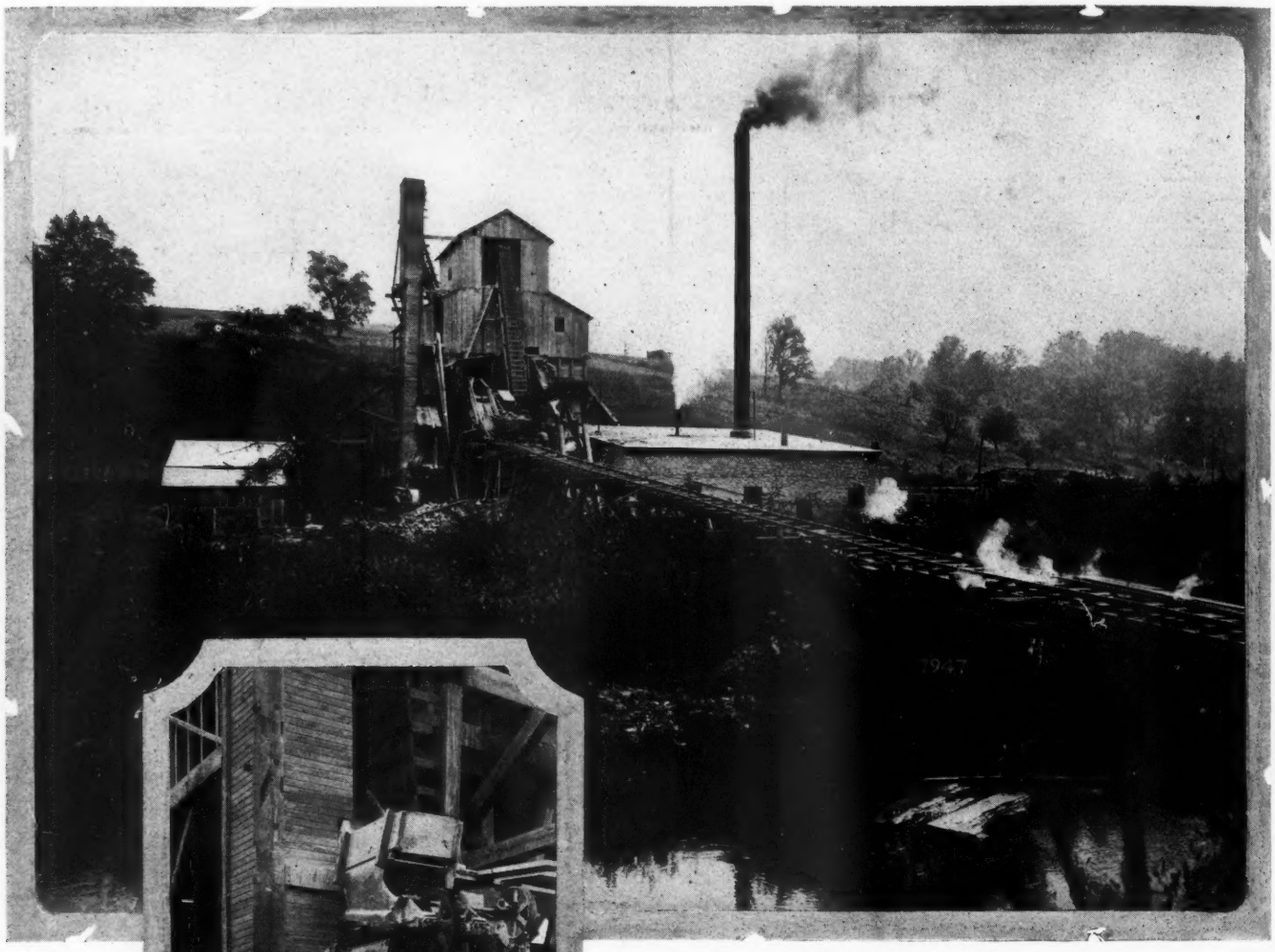
Traylor "Bulldog" Crushers are made for every kind and stage of crushing—in jaw to gyratory models.

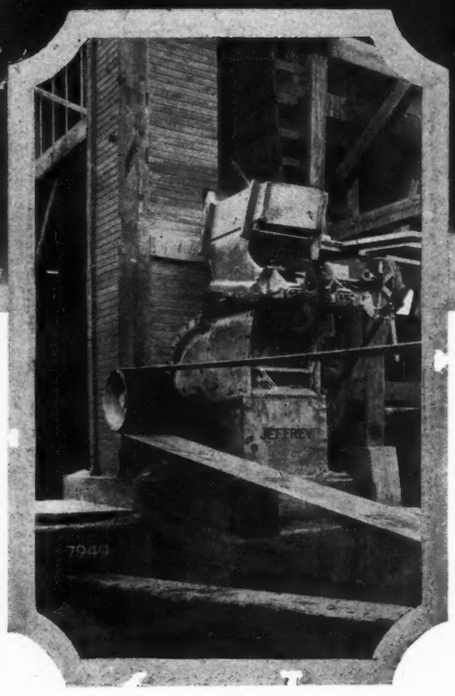
Traylor Engineering & Mfg. Co.

Allentown, Pennsylvania

New York 30 Church St. | Los Angeles Citizens Bk. Bldg. | Chicago Fisher Bldg.

Spokane Mohawk Block | Pittsburgh 211 Fulton Bldg.





Type "A" Pulverizer Reducing Limestone for Road Top Dressing

MANY Lime and Limestone Plants Such as Illustrated Above are Using

Jeffrey Swing-Hammer Pulverizers

for reducing Burnt Lime and Limestone to various commercial products.

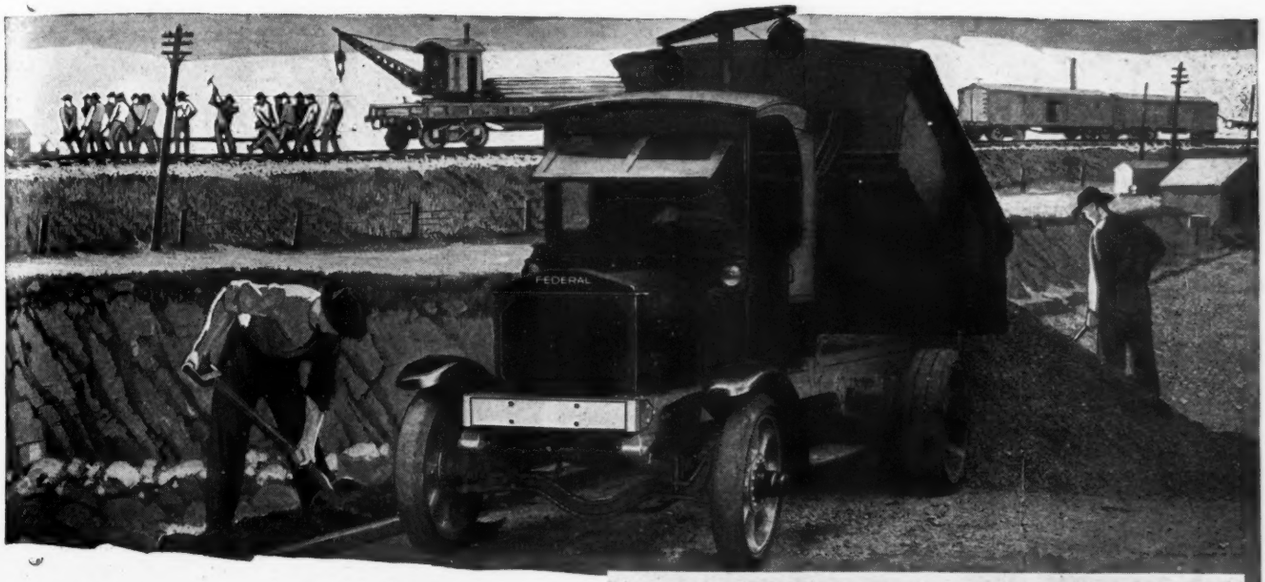
Machines made in several types suited to a variety of materials and products, and in numerous sizes adapted to plants of all capacities.

Write for Pulverizer Bulletin No. 147-D

The Jeffrey Mfg. Co., 935 North Fourth St. Columbus, Ohio

New York Boston | Scranton Buffalo | Philadelphia Cleveland Cincinnati | Pittsburgh Chicago Minneapolis | St. Louis Birmingham Kansas City | Dallas Milwaukee | Seattle Denver | Montreal Detroit

Manufacturers of Pulverizing, Conveying and Elevating Machinery; Chains; Self-Propelling Loaders; Electric Trolley and Storage Battery Locomotives, etc.



Shorten the Miles to Market

Thousands of additional miles of good roads are an imperative necessity during the nation's Reconstruction Period—

Paved highways to replace worn arteries of commerce—new roads blazed across lands and fields traversed until now only by rutted wagon trails.

In the national road improvement program now being fostered by the government, Federals are playing a big and vital part.

Brute strength—consistent service—day-after-day dependability and low operating cost are so nicely balanced in the truck's construction that Federals are to be found wherever the big jobs of better road building are in progress.

Federal "Traffic News," an interesting magazine on motor haulage, will be sent on request to responsible executives.

FEDERAL MOTOR TRUCK COMPANY
43 Federal Street DETROIT, MICHIGAN

FEDERAL

One to Five Ton Capacities

BUILD NOW

THE NATIONAL STATE AND COUNTY ROADS That Are Needed

U. S. DEPARTMENT OF LABOR

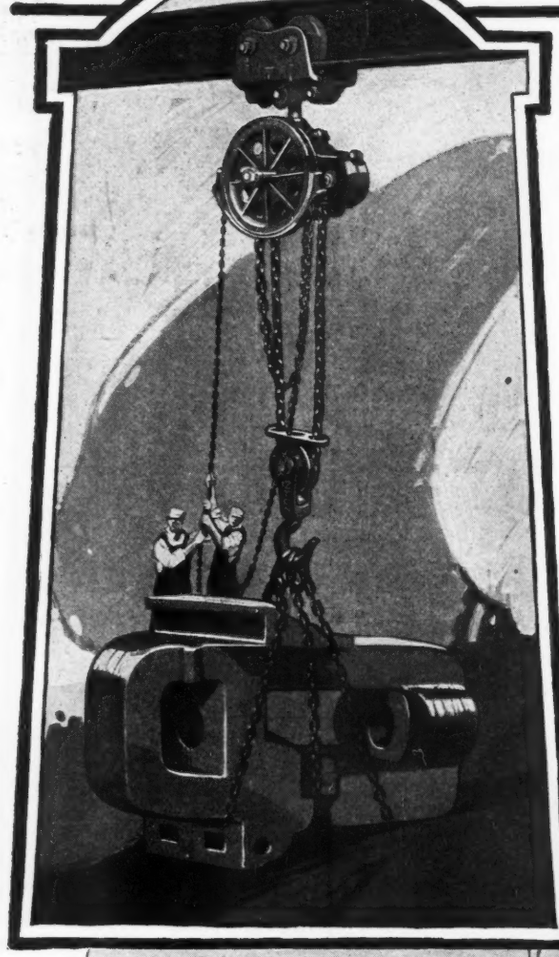
W. B. WILSON,
Secretary of Labor.

For additional copies address Roger W. Babson, Director General, Information and Education Service, Department of Labor, 1708 G Street NW., Washington, D. C.

The advertiser wants to know that you saw his ad in ROCK PRODUCTS

CYCLONE HOISTS

HIGH SPEED



Are You Using Cheops Methods?

NOBODY knows the exact methods that were used in building the Pyramids. All that is known is that the sheer, brute muscle of thousands of slaves must have been lavishly used.

In many places Cheops methods are still in use—men are using brute force to do lifting that could better be done by Cyclone Hoists.

One man and a Cyclone Hoist will do more lifting than a gang of men—and do it much quicker and cheaper.

Cyclone Hoists will cut costs and speed up production wherever there are weights of less than 40 tons to be lifted regularly.

Catalog showing their many mechanical advantages sent on request.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

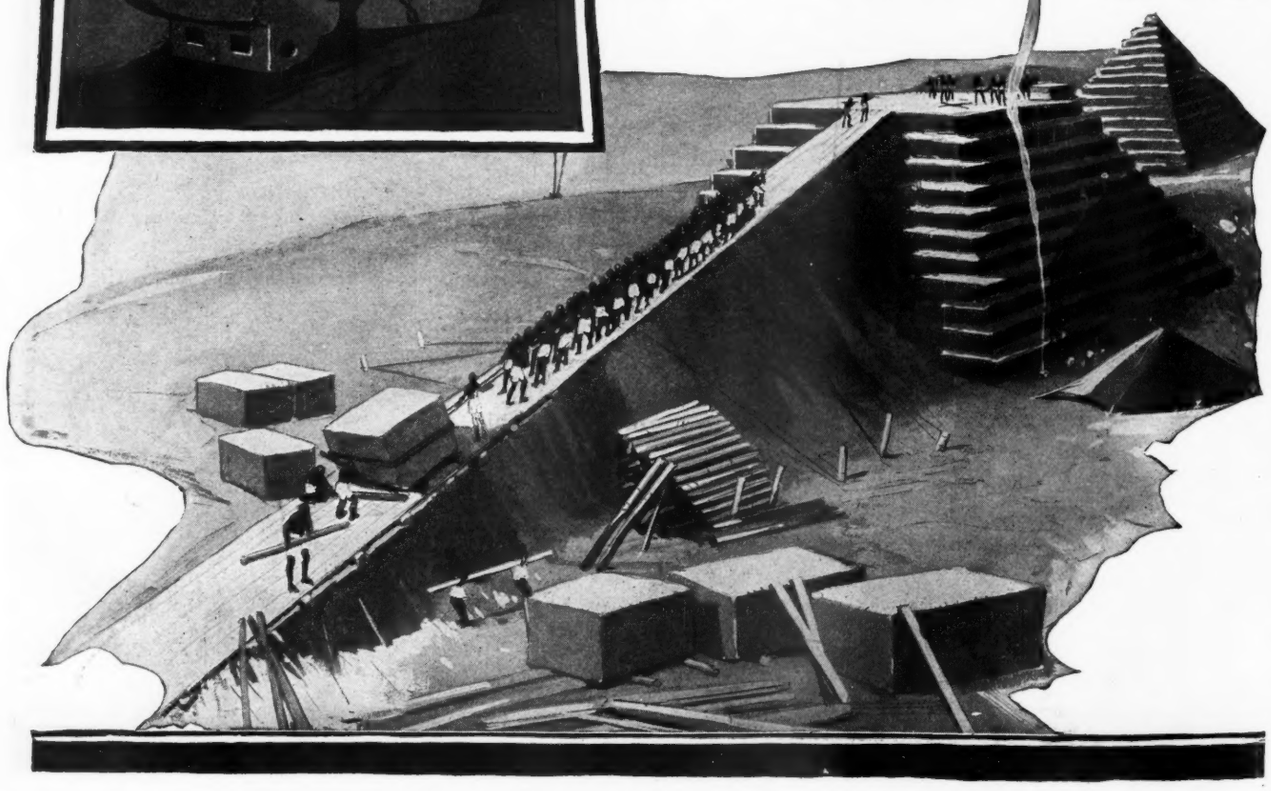
Hoists Cranes Trolleys

Branch Offices

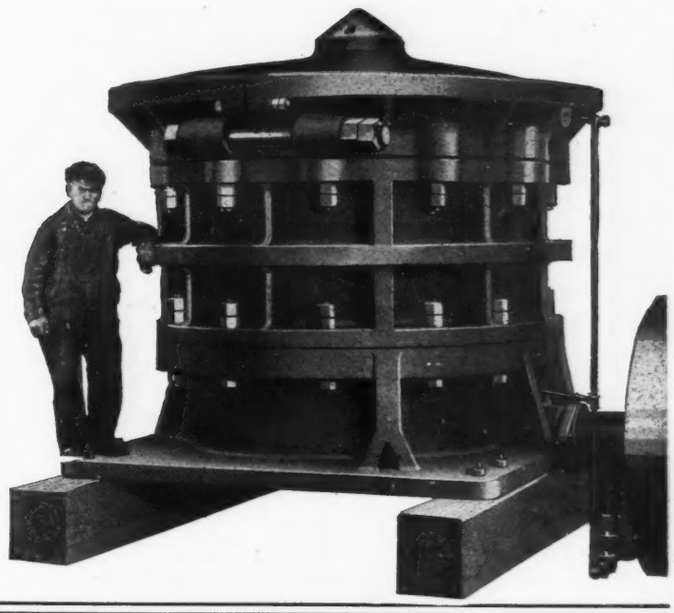
New York
30 Church St.

Pittsburgh
Henry W. Oliver Bldg.

Chicago
Peoples Gas Bldg.



The Telsmith Bolt-Shaft Breaker



Advertisement Number Five

The first and fundamental requirement in the design of a rock breaker is STRENGTH — strength of frame, strength of crown, strength of shaft, strength of gears. Let us measure Telsmith's supply of this prime essential.

FRAME—About 30 per cent shorter than in lever-shaft crushers—thick walls—wide, deep ribs. Get some catalogs and see what different crushers weigh per inch of height. You will find that, measured on this basis, Telsmith is the heaviest metalled machine built.

CROWN—This member is practically unbreakable. The spider arms are flat and strong, in striking contrast with the weak, high-arched crown of the lever-shaft gyratory. Metal is used liberally in hub, arms and rim. Shrinkage strains are eliminated by splitting the rim.

SHAFT—Unbreakable! We don't claim that other parts are absolutely proof against tramp iron (although sledges are seldom fatal to any part of a Telsmith Breaker); but the Telsmith pillar-shaft is **INDESTRUCTIBLE.** It doesn't spring —it doesn't break—it doesn't fatigue.

GEARS—Made of cast steel, with the teeth of the main driving gear shrouded by the inside hub. Neither pinion or gear have ever been known to fail until so worn as to require replacement.

STRENGTH — Strength of crown and frame — strength of shaft and gears — strength to crush the hardest rock—strength to survive when the sledge handle breaks—strength to serve faithfully through the steady grind of many busy seasons—that is the strength of the Telsmith Breaker.

We will be pleased to send you catalog No. 166, devoted to Telsmith Primary Breakers, and Bulletin No. 2-F-11, describing Telsmith Reduction Crushers.

SMITH ENGINEERING WORKS

3188 Locust Street, Milwaukee, Wis.

545 Old Colony Building, Chicago, Ill.
30 Church Street, New York City
930 Oliver Building, Boston, Mass.
Franklin and Channing Aves. St. Louis Mo.
Garfield Building, Cleveland, Ohio
523 Boston Building, Denver, Colo.
Road Builders' Eq. Co., Portland, Ore.
Watson Jack & Co. Montreal, P. Q.
Salt Lake Hardware Co., Salt Lake City, Utah.
625 Market St., San Francisco, Calif.

Prompt attention will be given your inquiry if you mention ROCK PRODUCTS

Trucks earn money only when working

EVERY minute a truck spends in the shop is a double expense. It is earning money only when working.

Trucks must be built right to keep out of the shop, but more is necessary—

They must be inspected regularly to prevent troubles due to natural wear and unnatural abuse.

That is why we maintain a monthly inspection service, by factory-trained inspectors—to make sure your trucks make good and continue to earn money.

That is why Pierce-Arrows are the most economical trucks in service. They are always on the job.

You cannot afford trucks that lose time when they should be on the job, earning money.

To say you saw the ad in ROCK PRODUCTS gives tone to your inquiry

EIGHTY-THREE hauling contractors operating 457 Pierce-Arrow Trucks in Metropolitan New York attest their superiority for haulage work because they

sustain a higher average speed without deterioration,
work longer hours without interruption,
haul more loads in a given time.

Measured by work done, Pierce-Arrow is the cheapest to buy.

Delivers more work in a given time;
Loses less time on the job and off the job;
Costs less to operate and less to maintain;
Lasts longer, depreciates less and commands a higher resale price at all times.

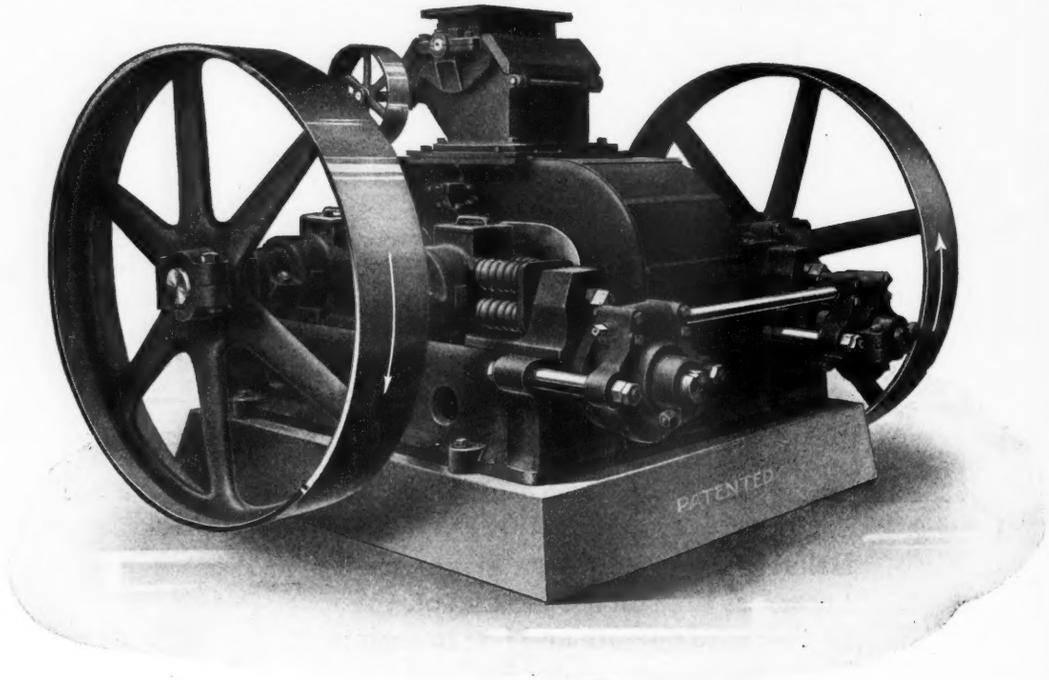
THE PIERCE-ARROW MOTOR CAR CO.
BUFFALO, N. Y.

Pierce Arrow

"ONE MAN – ONE MINUTE"

STURTEVANT "OPEN-DOOR" MACHINERY

BALANCED CRUSHING ROLLS



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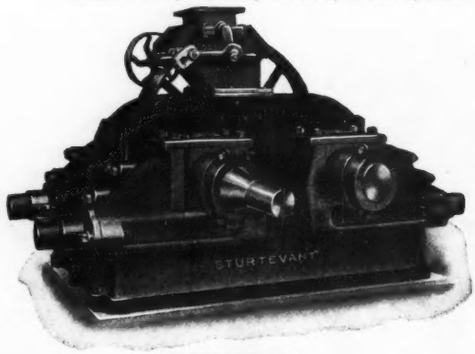
CRUSHING SHOCKS QUARTERED

Because the springs back of **all four** bearings allow the rolls to spring back in relief, **equally** and **oppositely,** thus balancing each other and **QUARTERING** the usual crushing shocks common to such machines.

Automatic adjustments, while operating—No shims—Great, strong, massive machines, built to withstand hardest usage, such as crushing of Ores, Emery, Alundum, Corundum, and other hard abrasives.

Sizes: 8x5, 12x12, 16x10, 20x14, 22x14, 26x15, 30x16, 32x16, 36x20, 38x20.



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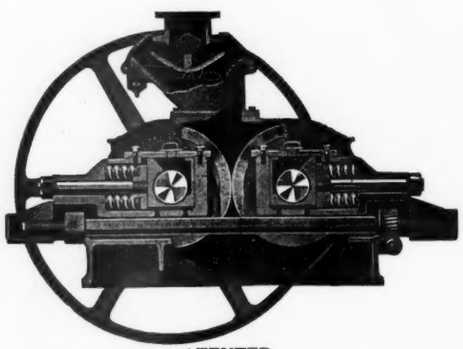
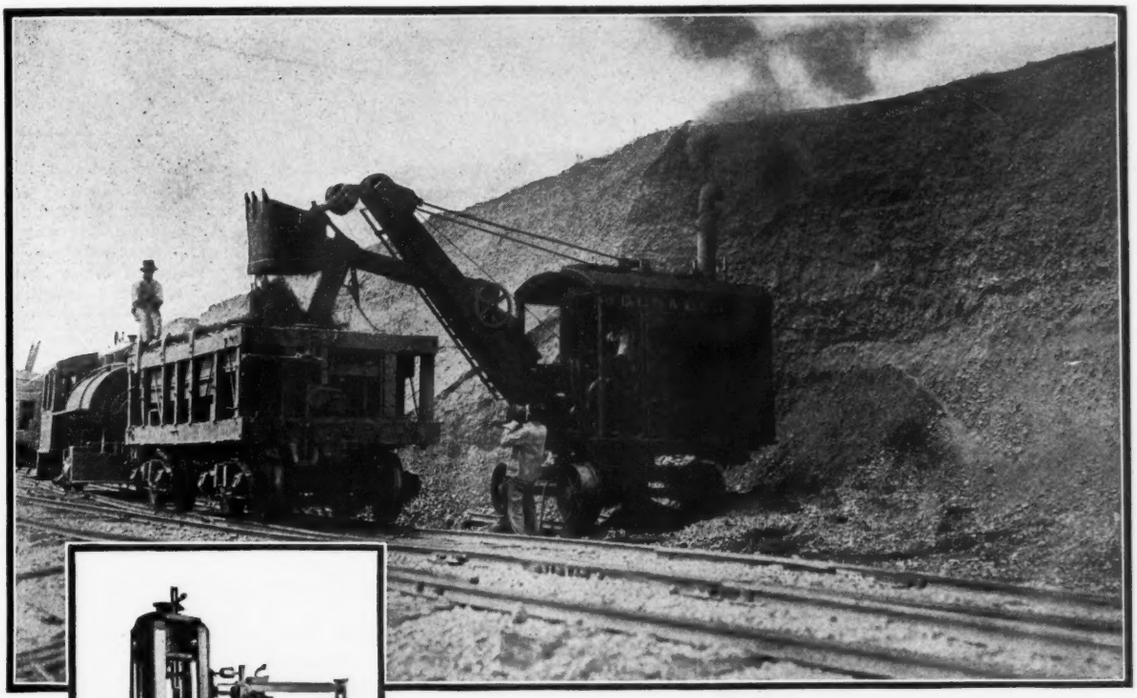


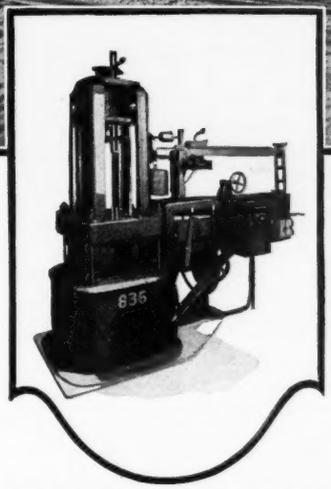
PATENTED

STURTEVANT MILL CO., BOSTON MASS.

HARRISON SQUARE

Saying, "I saw it in ROCK PRODUCTS," will bring quick action





Testing machine in physical laboratory at the "Marion" plant to determine the strength of various individual parts of "Marion"-built equipment. We have several such machines and keep them busy!

Steady Plugging Sure Does Count!

The H. D. Conkey Sand & Gravel Co. uses a "Marion" Revolving Shovel to dig gravel from a 25-foot bank at Yorkville, Ill., 40 miles from Chicago.

Without any noise, fuss or fireworks, this little outfit plugs steadily away for 9 months out of 12, so regularly that it hardly misses a single scoop the whole day through. The shovel averages 300,000 tons a year and during its first three years suffered *only one breakdown*—even that was not serious nor directly the fault of the shovel itself.

The owners are thoroughly "sold" on their machine—naturally enough. So are hundreds of other "Marion" users in sand, gravel and clay plants, stone quarries, etc. So will *you* be when you get fully "Marion"-wise. Why not ask for particulars today?

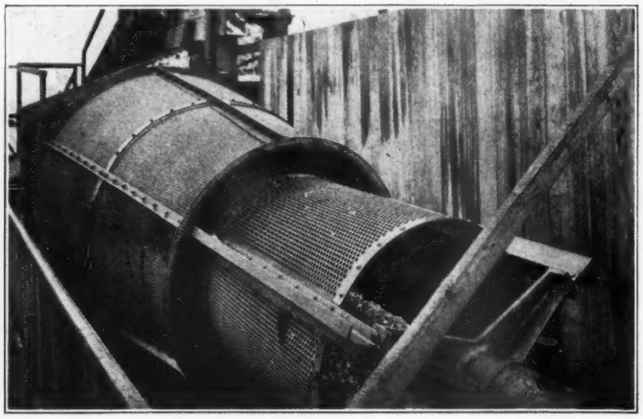
THE MARION STEAM SHOVEL COMPANY

Established 1884 Marion, Ohio

CHICAGO NEW YORK SAN FRANCISCO

Marion

The large illustration shows a Webster Cyl-Cone Sand and Gravel Washing Plant at Ludlow, Ky., owned by Ideal Supplies Company.



The Webster Cyl-Cone Screen, shown at left, permits a particularly economical arrangement and construction for a plant to make three or more size separations

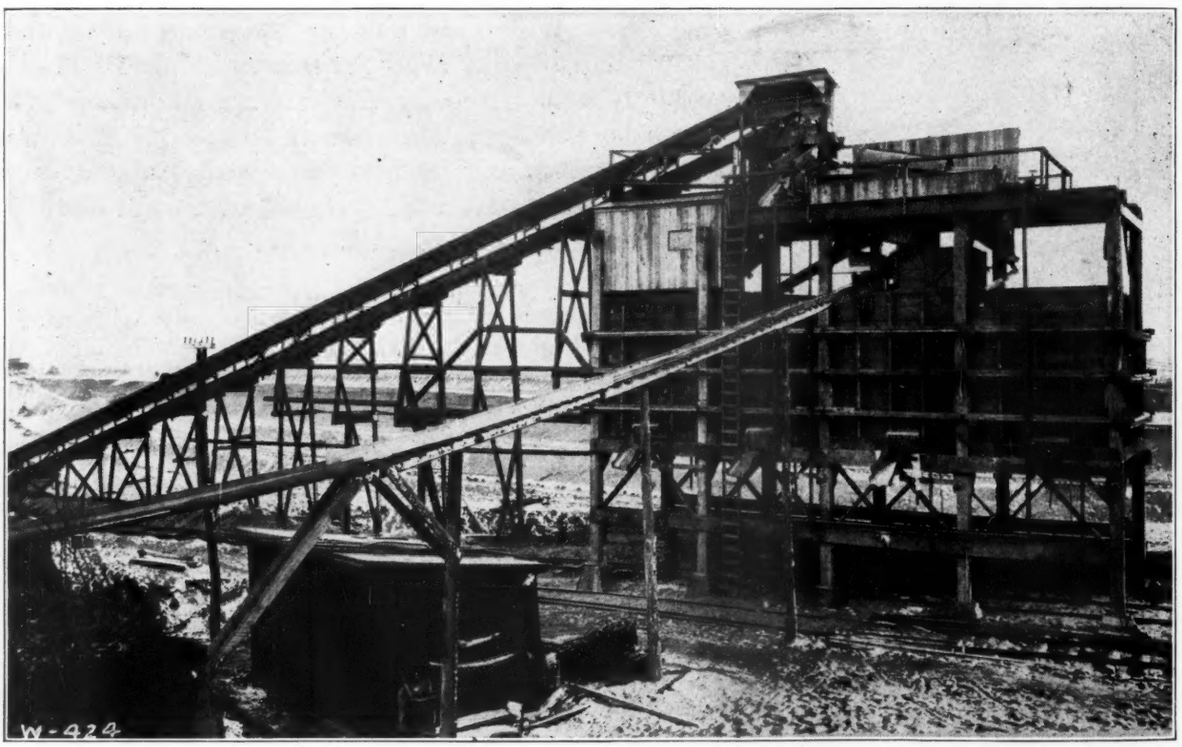
Buy WEBSTER Equipment

Webster Machinery will help get out more product and will cut the per ton costs of handling.

And because it is staunchly built, and designed intelligently for the work to be performed, it gives the user a maximum benefit at a minimum maintenance cost.

Since we build nearly every type of Conveying, Elevating and Power Transmission Machinery, we can supply the kind best suited to each specific need.

Catalog and Engineering Recommendations upon Request



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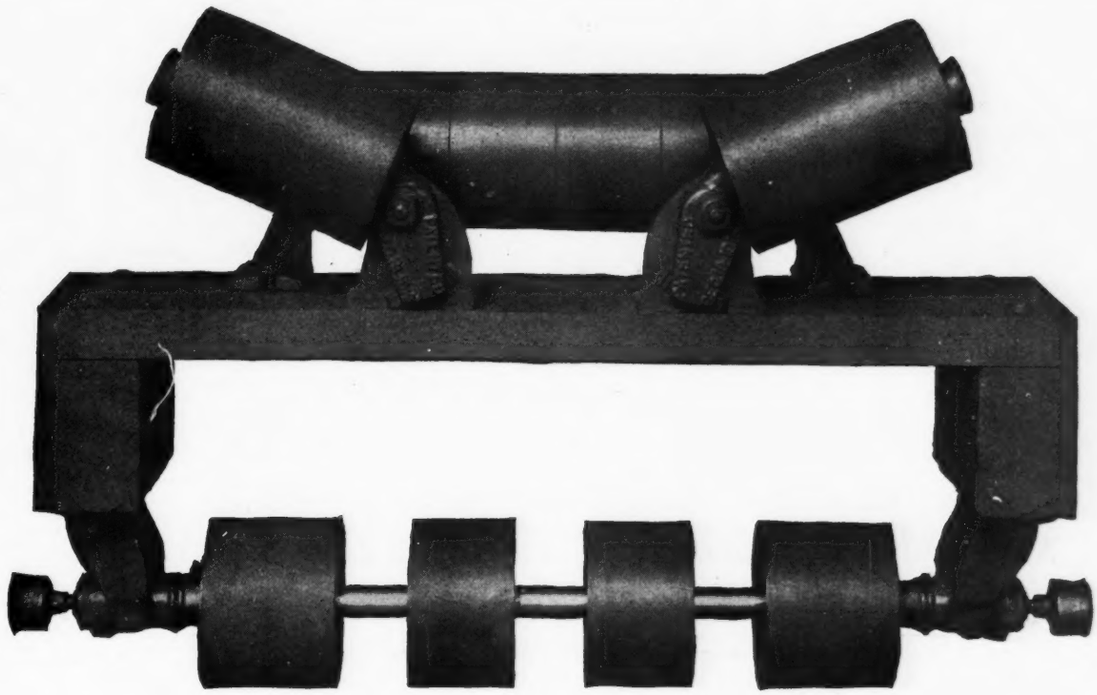
THE WEBSTER M'F'G CO., TIFFIN, OHIO, U. S. A.

New York, 90 West St. Boston, 114 Milk St. Union Central Bldg., Cincinnati McCormick Bldg., Chicago

For better service say, "I saw it in ROCK PRODUCTS"



A Troughing Roller that Saves the Belt

MORE and more, those who install conveyers are coming to realize the vital importance of selecting proper rollers to support the belt. It is common knowledge that ordinary rollers wear out the belt faster than does the load.

The exceptional life of Leviathan and Anaconda for conveying is notably increased when they are used on Main Adjustable Troughing Rollers.

The troughing pulleys are adjustable to three positions—10, 15 and 20 degrees from the horizontal. This is a very important feature, permitting changes in the trough of the belt to suit the volume and kind of material handled.

The troughing pulleys overlap the edges of the end pulleys on the center roll, thus eliminating any wear due to the belt rubbing against the edges of the rollers.

The design of these rollers, their scientific angles and correct methods of carrying the load, inevitably tend to increase the life of any belt placed upon them.

This matter of proper troughing illustrates the scientific thoroughness which is responsible for the success of the Main Belting Company's conveyer installations.

LEVIATHAN and ANACONDA ELEVATING TRANSMITTING CONVEYING BELTING

MAIN BELTING COMPANY - Philadelphia

New York Boston Chicago Pittsburgh Atlanta San Francisco

LEVIATHAN and ANACONDA ELEVATING TRANSMITTING CONVEYING BELTING

The advertiser wants to know that you saw his ad in ROCK PRODUCTS

WIRE ROPE
For IMMEDIATE SHIPMENT

You can't get a better combination than *Williamsport Wire Rope* and *Bourne-Fuller Service.*

Standard sizes and constructions, bright or galvanized, cut to lengths as requested. Catalog and discounts on request.

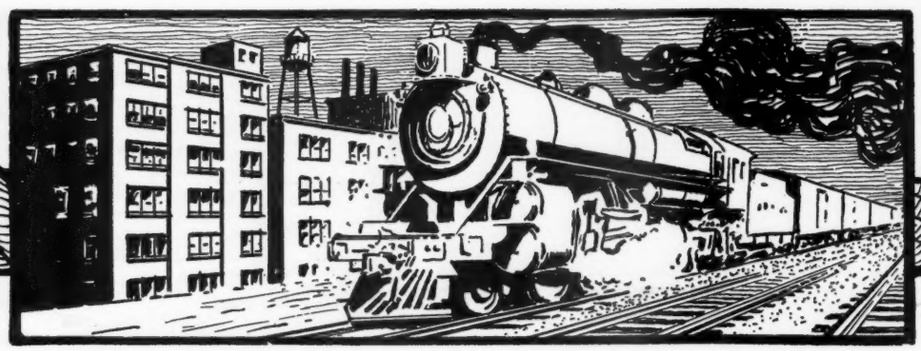
Bourne-Fuller

THE
BOURNE-FULLER CO.

Iron, Steel
Pig Iron
Coke

CLEVELAND

Pittsburgh
Detroit
Chicago
Cincinnati
New York
Toledo



"Results of a Symons Disc Crusher based on figures more than satisfy us."

"SOME PRODUCTION RECORDS"

Size Crusher	Size Feed	Size Product	Capacity Tons per hr.	Power
18 in.	1½ in.	¾ in.	12	20 H. P.
24 in.	2 in.	1½–1 in.	25	20 H. P.
24 in.	1½ in.	½ in.	15	30–40 H. P.
36 in.	2–4 in.	¾ in.	50	35 H. P.
36 in.	3½ in.	¾ in.	50	25–30 H. P.
36 in.	½–4 in.	1 in.	30	40 H. P.
48 in.	2–7 in.	1 in.	50	50 H. P.
48 in.	3 in.	¾ in.	45	.... H. P.

Names supplied on request.

Tell us exactly what you want to accomplish. We will recommend proper crusher to use.

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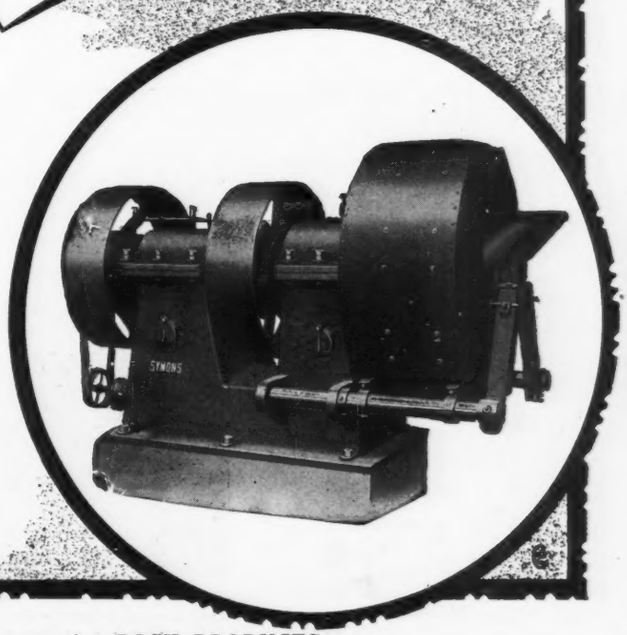
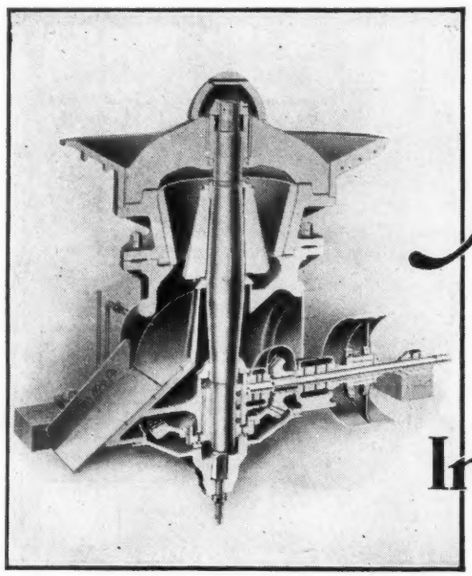
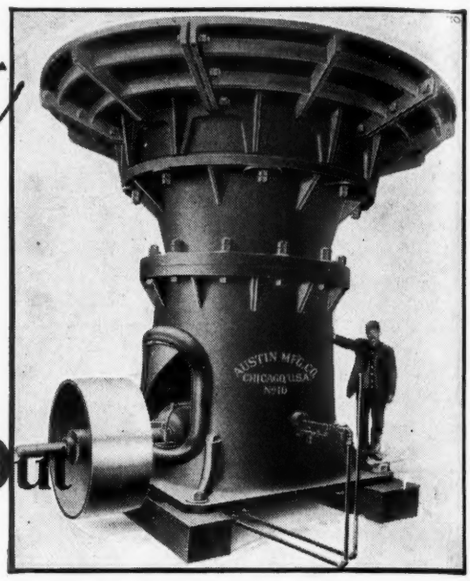


You will get entire satisfaction if you mention ROCK PRODUCTS



Austin
Rock Crushing
Equipment

Examine
both
Inside and Out



Austin Gyratory Crushers and Quarry Equipment

The demand for crushed stone is an ever-increasing and permanent one. Why not make a permanent business of supplying the trade?

Austin Crusher Equipment is permanent in the sense that it is built to last. Steady output from day to day, with small repair bills, is the Austin way of cutting down production cost. Quarry owners who are often remote from machine shop help appreciate Austin durability.

Austin screens, elevators, quarry cars, hoists, etc., are built, like the crusher, TO LAST.

Get our new crusher catalogue No. 28. It tells you how to go about fitting up a modern quarry with money-making equipment.

AUSTIN MANUFACTURING COMPANY **CHICAGO**
NEW YORK **SAN FRANCISCO**

War Quarry operated by the American Army in France; equipped with Austin Gyratory Rock Crushers, Screens and Elevators.

To say you saw the ad in ROCK PRODUCTS gives tone to your inquiry

AETNA DYNAMITE—of a particular grade that will suit your individual requirements—should be the first point to turn to on your dial of blasting problems, because it is so made as to represent, figuratively, when properly loaded, the right "tumbler" in your locked-up strata. And, Aetna Dynamites differ essentially from most brands in that they produce less fumes.

Turning to "Lion" Electric Blasting Caps, they contain a Fulminate of Mercury charge, which makes them the most dependable and efficient detonator known. We direct your attention to the .30 calibre diameter of "Lion" Electric Blasting Caps. The advantage of this diameter shell is that it gives the maximum concentration of charge, which is of vital importance. If a smaller diameter shell is used the same sized charge would be proportionately longer, and instead of a powerful blow being delivered upon a small area—such as our .30 calibre shell gives—there would be a diminished one over an extended area, with the possibility of imperfect detonation.

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Finishing up the combination with a "Lion" Blasting Machine, we have in it a powerful dynamo, simply constructed, yet in such a way, and of such materials, that it withstands hard usage and comes as near taking care of itself as any machine can.

AETNA EXPLOSIVES COMPANY, Inc.

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BRANCH OFFICES:

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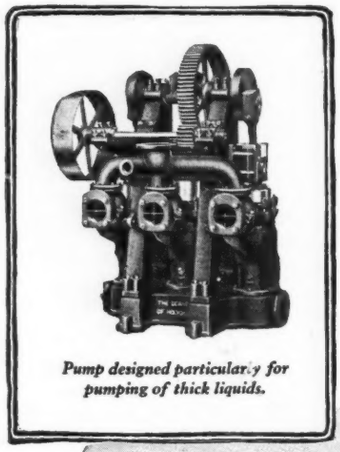
It gets immediate attention if you mention ROCK PRODUCTS



Pump designed particularly for pumping of thick liquids.

The peculiar pump for paper pulp—an example of Worthington thoroughness

PUMPING thick pulp—a task for an unusual pump. Yet it is characteristic of the thoroughness of Worthington that this company meets not only this, but every other hydraulic need of the paper industry, with equipment which takes into account all the peculiarities of the service.

So, too, are the individual needs of every important industry met by Worthington with lines that are complete. And right there—there in the completeness of the line and the 79-year-old reputation for soundness of design and good workmanship—is one reason why Worthington today stands foremost in its field.

WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
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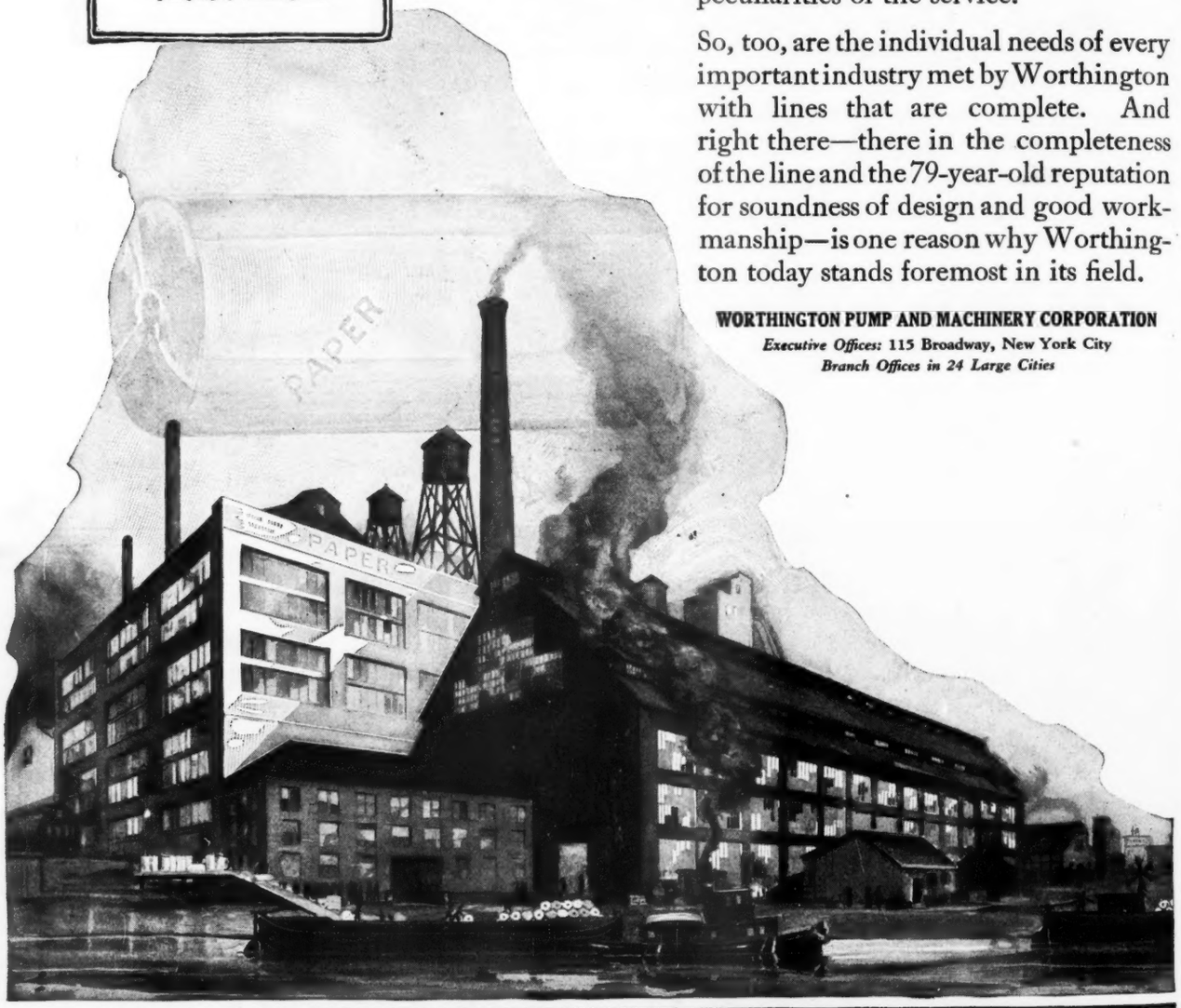

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

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Deane Works, *Holyoke, Mass.* Hazleton Works, *Hazleton, Pa.* Laidlaw Works, *Cincinnati, Ohio* Gas Engine Works, *Cudahy, Wis.*
Blake & Knowles Works *East Cambridge, Mass.*
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Saying, "I saw it in ROCK PRODUCTS," will bring quick action

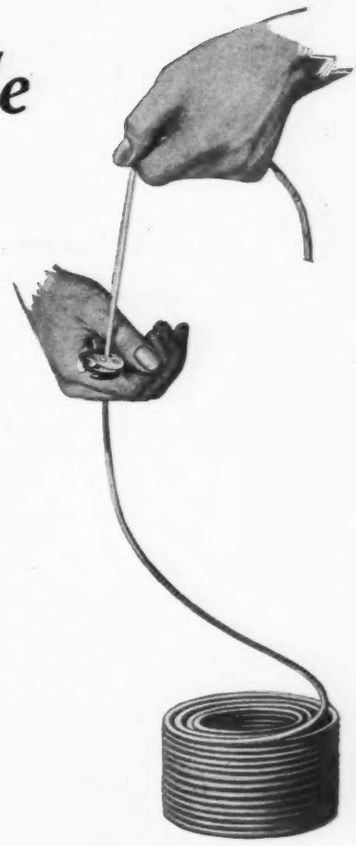
Blasting Supplies

that are dependable

In all work calling for the use of explosives, it is extremely important that the accessories known as Blasting Supplies shall be of the very highest quality. Defective or weak detonating devices often imperil both life and property—and result in a loss of explosive energy, if no more.

In the manufacture of Atlas Blasting Supplies the most scrupulous care is exercised to make them thoroughly practical, effective and RELIABLE. The ATLAS name on detonators, galvanometers, rheostats, blasting machines and other blasting supplies signifies that they are as safe and sure as it is possible for experience and manufacturing skill to make them.

Our Service Division will gladly confer with you as to what detonating supplies will give you the most economical service.



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Electric Blasting Caps
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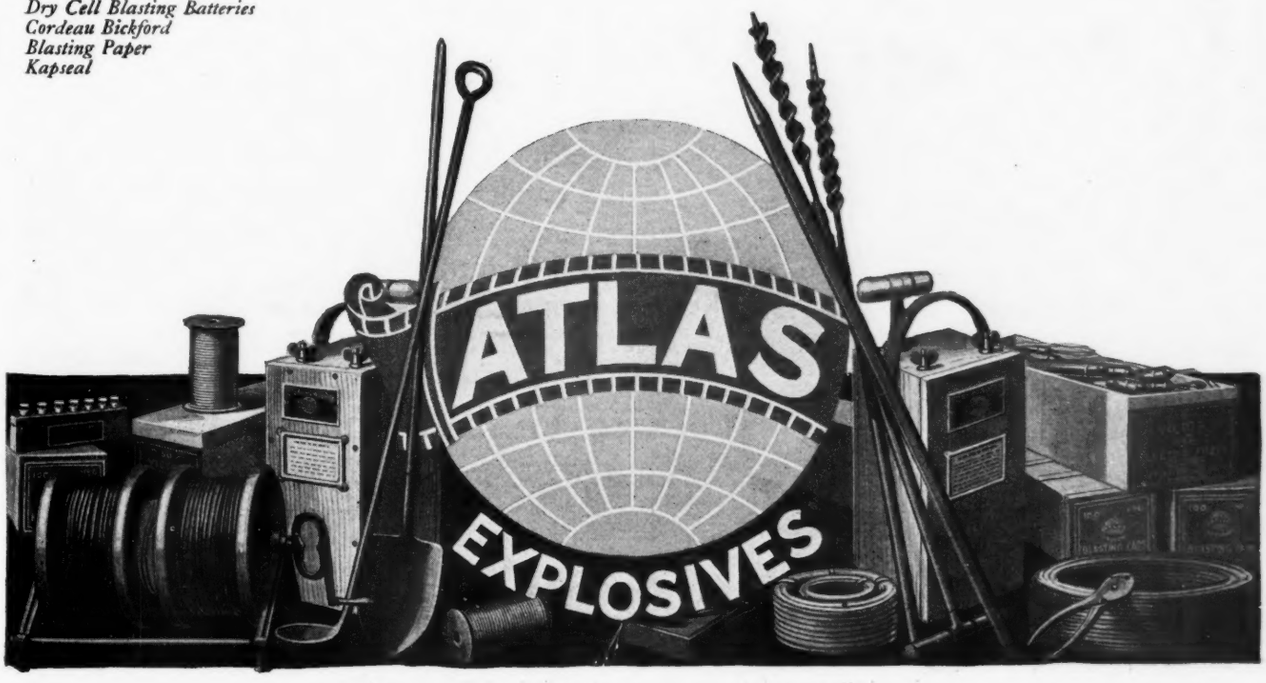

BROWNING

"The All-Around Champion"

WHEN you buy a locomotive crane you are making an investment that should pay you good dividends for years. Don't limit your profit by buying a crane for one job that you can not use on any job. It is better business to buy a crane that will do all the work that any other crane will do, and then do a few extra jobs for good measure

The Browning Locomotive Crane is so designed that it will give the widest service possible. It can be equipped to handle a hook block, an electric magnet, any bucket for any purpose, a steam shovel dipper, a pile driver hammer and leads, or a drag-line scraper. Then add to these points the fact that it is strong enough to shift several cars, and you begin to get an idea of its versatility.

A crane should be bought only after a careful investigation of its merits and possibilities. The Browning Company invites the most searching investigation into the merits of Browning Locomotive Cranes and Browning Buckets. It is to your financial interest to accept this invitation. Catalogs of both on request.

The Browning Company
Cleveland, Ohio, U. S. A.

SALES OFFICES:
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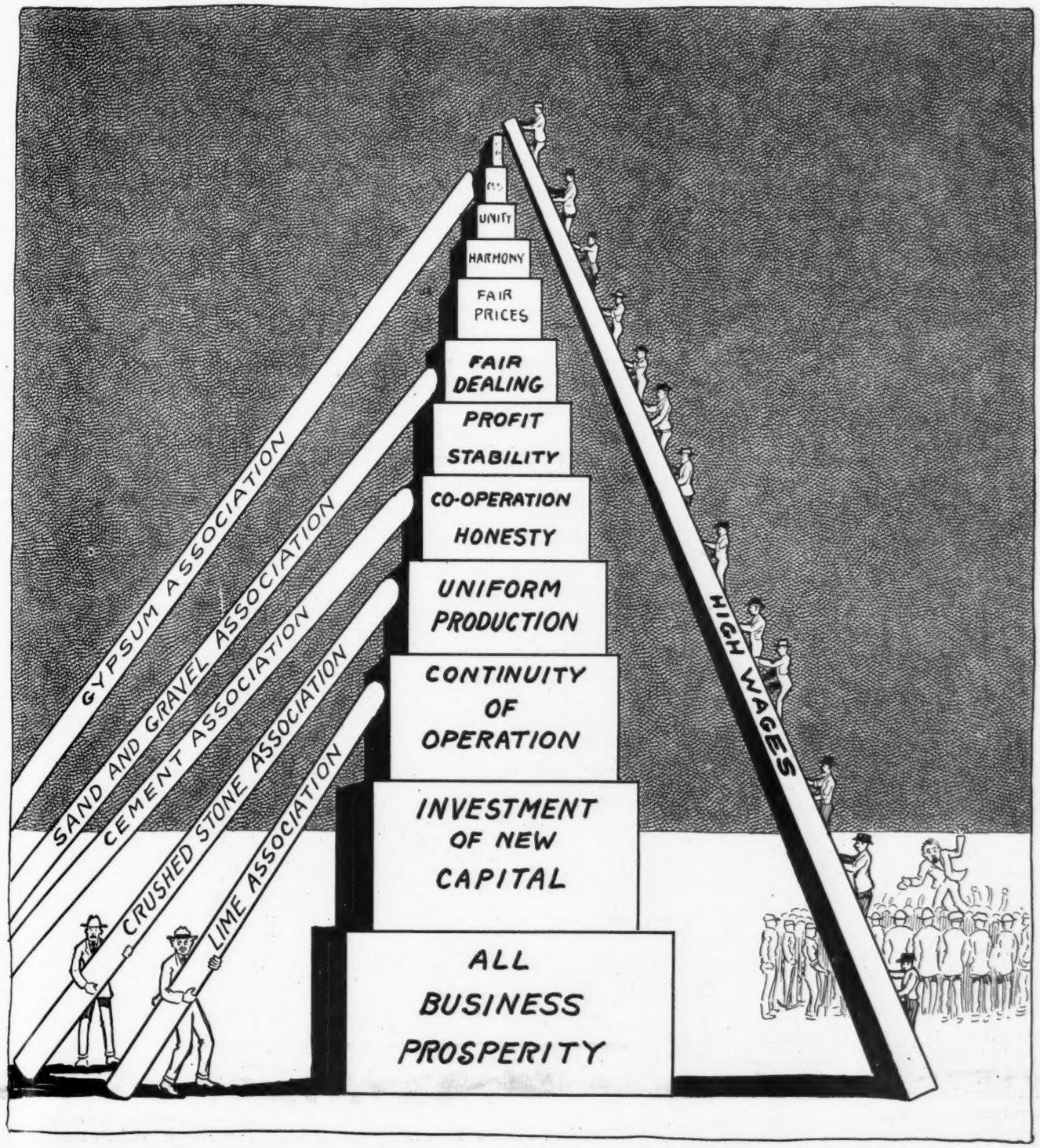
Browning "Buckets that Bite"

Rock Products

Vol. XXII | Chicago, October 11, 1919 | No. 21



Reorganize National Lime Association

New Constitution Adopted at Washington Meeting Provides for Promotional Work by District Organizations

CONSIDERABLE CHANGE in the policy of the National Lime Association was made at the Washington meeting, October 1, which was called to act on the report of the committee on reorganization. The session was a stormy one, and there was much difference of opinion expressed as to the effect of the changes on the future of the Association.

Charles Warner, of the Charles Warner Co., Wilmington, Del., was elected president. Mr. Warner is one of the five or six lime manufacturers who founded the original National Lime Manufacturers' Association some 15 years ago. He is a man who enjoys the confidence and good-will of the entire membership, and much satisfaction was expressed that he should be chosen to start the Association under the new scheme of organization.

Officers of the National Lime Association

PRESIDENT—Charles Warner, president of the Charles Warner Co., Wilmington, Del.

VICE-PRESIDENT — George Nicholson, Jr., president of the White Marble Lime Co., Manistique, Mich.

TREASURER—A. H. Lauman, president of the National Mortar & Supply Co., Pittsburgh, Penn.

SECRETARY—Norman G. Hough, Washington, D. C.

Local Promotional Work

The problem the Lime Association had to face is the same which every trade association made up of localized industries either has faced or must face before it can get on a stable basis. That is the problem of promotional work for increasing the sale of the product represented.

The Lime Association as formed at Cleveland something more than a year ago was modeled along the lines of the Portland Cement Association with a strong central organization to direct all publicity, promotional and research work. Owing possibly to the more localized character of the lime industry this scheme of organization has not worked out to the satisfaction of a group of manufacturers in the eastern territory who represent a goodly proportion of the country's lime production.

The element in the Lime Association which has been instrumental in bringing about the change in organization believes that the National Association staff should be relieved of all detail promotional work. It has been contended that promotion experts in the field, acting under orders or directions from the Washington headquarters, were not in that close touch with local conditions and with district members, which is desirable for the greatest benefit to the members.

Their argument is that all general promotional work resolves itself into one of two divisions: (1) Research work, including constant contact with Government agencies and other industries; the collection and use of facts and data which have a national aspect; publicity, etc.; (2) the application of the data gathered by the foregoing agency to localities for increasing the demand for and the consumption of lime. The argument is that (1) is the function of the national organization, and (2) the function of the district organizations.

Carrying out this plan, of course, involved cutting down the appropriations for the national organization, and, in the eyes of many, weakening it.

President Charles Warner

Changes in Constitution

The revision of the constitution to carry out these principles was made by a committee of the following members: John A. Kling, chairman, president of the Kelley Island Lime and Transport Co., Cleveland, Ohio; Charles Warner, president of the Charles Warner Co., Wilmington, Del.; William E. Carson, president of the Riverton Lime Co., Riverton, Va.; George B. Wood, president of the Rockland and Rockport Lime Co., Rockland, Me.; and Bernard L. McNulty, secretary of the Mitchell Lime Co., Chicago, Ill. This committee met in New

York City, August 21, and studied the problem very thoroughly. These changes were made:

ELECTION OF DIRECTORS—The election of directors is to be made by ballot of the members respectively located in the 14 districts into which the industry is divided. Nominations for directors, signed by at least three members of any district, are submitted to the membership of the district on the official ballot, and each district is to elect the directors to which it is entitled prior to the time of the annual meeting. Districts which have an annual production in excess of 200,000 tons are entitled to two directors; in excess of 400,000 tons, three directors. A majority of the board constitutes a quorum.

DUES—The general dues for the maintenance of the national organization are not to exceed 2½ cents per ton. (These dues have been 4 cents per ton.)

DISTRICT ORGANIZATIONS—The by-laws provide: "A group of member companies in any district or group of districts within boundaries which they may determine, may form their own local organization as a District Bureau of the National Lime Association, and employ their own promotional staff and field men by paying special dues to support such local organization, the amount of such dues to be determined among themselves. Any district so organized must conduct its work to conform with the general policy of the National Lime Association, and may, if it so elects, collect either the general or special association dues from its members and pay the same when due in a lump sum to the Association. Special dues so contributed shall be returned to the district organization as called for, to be wholly spent in the district as designated by the contributing members. Each local district organization must be governed by its own board of directors, subject to policies adopted by the board of directors of the National Association; and the members from such district serving on the board of directors of the National Association must be chosen from the membership of the district board."

Provisions for Smaller Districts

Where special dues are not sufficient to support a field organization in any district it is expected to combine this promotional work with that of some other district similarly situated, so that two or more such districts may lump their special assessments and do their promotional work with a single organization. No part of the 2½ cents per ton general assessment may be used for such local promotional work, but the headquarters staff may render any assistance possible to the smaller districts short of actual field promotional work.

President Warner has especially asked

OWING to the limitation in time between the meeting and this issue, Rock Products was unable to obtain photographs of Vice-President George Nicholson and Treasurer A. H. Lauman.

ROCK PRODUCTS to carry the message to the lime industry that he is willing and anxious to devote a large part of his time to organizing the smaller districts and in inducting the members in these districts to provide special funds for promotional work.

The only districts which at the time of the Washington meeting were apparently prepared to handle their own promotional work were Nos. 1 and 2, comprising the New England States and the Atlantic States as far south as Maryland. It is probable that these two districts will combine, raise special dues of 8 or 10 cents per ton, and immediately put a staff of field men at work in both the construction and agricultural fields, with headquarters in New York City.

Overlapping Territories

The district organizations in the main will be based on contributory producing territory. The thought, of course, occurs, what provision is made for promotional work in *overlapping selling territory?* There is no provision in the constitution or by-laws which will prevent a producing district from sending a field promotion man into another producing district to do work in the interest of his district organization. But such a field man will not be allowed to do any kind of work which, in the judgment of a majority of the board of directors of the National Association, is contrary to the policy of the national organization, or, in other words, detrimental to the best interests of the lime industry.

Secretary Norman G. Hough

It is not expected, however, that many such instances will occur; and in event they do, it is deemed that the board of directors of the national organization is fully capable of dealing with them.

Headquarters Staff

It has been decided by the present board of directors that in the interest of economy certain efforts of the national organization should be at once consolidated and the organization relieved of all detail promotional work. It is intended to preserve as they are, the research or chemical bureau and the agricultural bureau of the National Association. The work now performed by the construction bureau will be taken over, probably with the same staff, by the district organizations.

Robert F. Hall, general manager of the National Association, has resigned, and it is probable that the office of general manager will not be filled in the immediate future. Norman G. Hough, recently chief of the construction bureau, has been made secretary of the National Association, and will be the officer in charge of the Washington headquarters.

Bureau of Mines Dedicates New Laboratories

THE BUREAU OF MINES, Department of the Interior, in co-operation with the Pittsburgh Chamber of Commerce, dedicated its new million-dollar laboratories at Pittsburgh, Pa., with appropriate national ceremonies on September 29, 30 and October 1.

The work of the Bureau covers the various ramifications into the safety and efficiency of the mineral industries, the prevention of waste in the natural resources and their products, and other improvement manufacturing processes.

The Cummins Interstate Rate Bill

THE CUMMINS BILL, restoring to the Interstate Commerce Commission full power in the matter of interstate rates, has been passed by the House with an amendment making it necessary to have the approval of state commissions before increasing intrastate rates.

This measure is intended to take from the President the arbitrary power of making transportation rates, and will furnish the shippers an effective weapon for combating any additional increases which might be proposed during the balance of Federal control.—Chicago Sand and Gravel Producers Association News Letter.

Industrial Democracy Pleases Men

This Unique Plan Pleases Workers, Improves Their Efficiency and Ingenuity and Increases Production

By B. C. Forbes
Editor Forbes' Magazine

INDUSTRIAL DEMOCRACY is based on our national form of government. There is set up in each large organization a President, a Cabinet, a Senate and a House of Representatives. The Representatives consist wholly of the workers themselves and are elected, by secret ballot, by their co-workers. Before any action relating to hours, wages, piece-work rates, health, production, or, in short, anything whatsoever affecting the workers, can be adopted it must first come before the workers and receive their approval.

As told in previous issues, in no single instance has the president of any corporation or firm operating under the Industrial Democracy plan been obliged to exercise his power of veto once a measure has been approved by the legislative bodies—a remarkable testimony of the sobering, broadening, enlightening effect the granting of power has upon employes.

President Wilson, in his cabled message to Congress, pleads for "a genuine co-operation and partnership in control." He says further: "The new spirit and method of organization which must be effected are not to be brought about by legislation so much as by the common council and voluntary co-operation of capitalist, manager and worker." The President likewise pleads for "the genuine democratization of industry." His exhortation is for the application of the tenets of Industrial Democracy to business. The Leitch system, under years of practical test under good times and bad, under the stress of war and prosperity of peace, in plants employing men and in plants employing women, in plants employing high-priced labor and in plants employing low-priced labor, has successfully met every condition, solved every management problem, satisfied the workers and increased the profits.

We gave in our issue of (September) a long article by President Leopold Demuth, of William Demuth & Co., the largest tobacco pipe makers in the world, in which he recounted his experiences with the Leitch plan during the last two years and answered the questions most commonly asked by other employers seeking a way out of their labor troubles.

Here is a little statement made, not by an employer, but by one of the ordinary workers in the Demuth plant, Harry Liebold, the representative of the amber mounting department:

"I have seen Industrial Democracy in operation at this factory for the past two years and the main reason I am for it heart and soul is because I know that through it I can always get a square deal.

"When a man in my department has a grievance, he comes to me and tells me about it, and he knows that I will take the question up at the next meeting of the House of Representatives, and consequently the foremen in the Senate and the 'bosses' in the Cabinet will hear about it. They will act on it one way or another, and my experience has been that every question has been settled fairly. Before we had Industrial Democracy, a man with any cause for dissatisfaction would most likely keep it to himself or tell the other workers about it. Perhaps the manager would be too busy to listen to him, so he would nurse his grievance and very likely he would quit. Industrial Democracy prevents just such little troubles before they get big.

"Nowadays at the plant you never hear a foreman urging the men to get on the job. There is no need for it. We all know that by doing our best all the time we are increasing our own dividend. Now whenever a man 'knocks off' early, comes in late or takes a holiday, it is not the boss that wants to know the reason why, but the other men and women workers whose dividends he is lowering.

"Before Industrial Democracy was put into effect it was every man for himself; now it is all for one and one for all.

"I have been in this shop for 20 years and I have never seen the desire to co-operate with the other departments and help the other fellow out so strong as it is now.

"Years ago if a worker had a grudge against the foreman he would probably lay down on the job whenever he thought he wasn't being watched; but that is a thing of the past, for whatever complaints a man has are now always quickly settled in a way satisfactory to everybody.

"Another thing: Industrial Democracy has proven that some of our men had stored up in their minds ideas for new machinery and other labor-saving devices; but they kept these plans to themselves. They were not sure of their reception by the management. Now a man with a good idea knows that not only will his suggestion be welcomed, but that, if practical, it will be rewarded. In our plant today labor and time-saving machinery invented by the men is lowering the costs, increasing production and thus earning dividends.

Practical Matters Discussed

"Industrial Democracy has given us our voice in the management of the shop; it has given us a lunch room where we can get good meals for 20 cents; it has made this shop a better place to work in; it is teaching English to our foreigners and helping them to become Americans; it has taught us that the firm has troubles and worries just the same as we have, and that by working and co-operating together we all benefit.

"That is what I think of Industrial Democracy as I see it at the Demuth plant, and I think all of the 900 workers here agree with me."

I attended a recent meeting of the Senate and also of the House of Representatives of the Demuth plant. The Senators, consisting of under-executives, superintendents, foremen and others under chief executive grade and above the rank and file, occupied themselves chiefly in discussing problems incidental to obtaining, promptly, adequate supplies of certain materials. This meeting was not very much different from the typical conference of men entrusted with the handling of workers and concerned with production.

The proceedings in the House, however, were unique. Promptly on the hour of meeting, some 30 workers, including quite a number of women, trooped into a large meeting place—a newly-opened lunch hall. It was discovered that several Representatives were absent. The Sergeant-at-Arms (I think that was his title) obtained a list of the absentees and immediately went off to round them up. Excuses that they were "terribly busy" on this, that or the other piece of work were not accepted.

The Speaker of the House was an intelligent-looking, thick-set young man, a fine specimen of the Italian worker. He called the House to order in a thoroughly business-like way. At the table by his side was a girl secretary, who, having made a record of the roll call, proceeded to read a summary of the proceedings at the previous meeting, a week earlier.

The session was then open for the bringing up and the discussion of any

question or any other matter of any kind which any Representative wished to receive consideration.

Most of the subjects were technical ones, concerning departmental matters. There was a most lively discussion between Representatives of different departments as to whether the failure to obtain uniform excellence in a certain quality of pipe was due to the sandpaper used in polishing the wood or to the workmanship on the pipe before or after it left the polishing department. The spokesman of the polishing department insisted that the sandpaper used was the very finest grade made and claimed that if the finished product were not up to standard, the fault would have to be sought elsewhere. So earnest did the men become in their endeavors to locate the fault that several times the Speaker had to rap his gavel and insist upon only one Representative trying to speak at the same time.

Profit-Sharing Plan Reaches All

Another subject discussed was whether it would expedite the movement of pipes-in-the-making in their progress through the factory if a great many more trays were furnished. Some Representatives contended that the greater the number of trays, the greater tendency to let the pipes accumulate. Every angle of the question was discussed, and I could not help but remark how valuable such practical discussions must prove for the executives—a full record of the proceedings is kept and made available to all.

A complaint was made that it had not always been possible to obtain small lots of samples promptly. The Representatives of one department got up and said that, as he knew that the whole organization depended upon the selling of the product, he always gave samples the right of way. The talk developed that a certain department was evidently a chronic laggard in this matter. The Representative from it was asked to give an explanation. He confessed that the dislocating of the regular schedule of operations in order to put through a picayune lot of pipes had been regarded in his department as something of a nuisance, and that it was true that on occasion sample lots had been sidetracked for a while. The importance of the prompt turning out of samples having been thus brought home to them, however, they would mend their ways in the future.

And so it went, from one practical, matter-of-fact subject to another. All these questions and problems and complaints, be it noted, were tackled by the men themselves and settled by the men. Most of the work was delegated to small committees, which make all necessary investigations, and then come back with a solution or recommendation. In the plant run in the ordinary way these thousand and one matters, little and big, would devolve upon the management, and inevitably some of the decisions rendered from above would be more or less unsatisfactory to the workers. Here, however, the workers were completely satisfied since the decisions were made by themselves.

This is one outstanding advantage of Industrial Democracy over profit-sharing or any other methods which have been tried. It gives the workers a manly share in the responsibilities of management, thus increasing their self-respect, their industry and their loyalty, and makes them feel that life is a fuller and more worth while thing than before. Incidentally, the fifty-fifty sharing of increased profits under the Leitch plan has not the fault of reaching merely the higher-ups and the skilled workers, but goes right down to the youngest boy or girl in the shop and is recognized by all as absolutely fair, since the amount of the fortnightly distribution is regulated by the efforts put forth by the workers themselves.

Recently I paid a visit in company with John Leitch to one of the plants operating under Industrial Democracy. Mr. Leitch consented to show me through the place, and I was impressed by the attitude manifested towards him by the workers. As a rule, the moment they saw him enter the door of their department they raised a vigorous cheer.

I questioned Mr. Leitch and he told me that in that particular department, where the work was monotonous and trying, he had a little while before made a suggestion to the workers that on the stroke of ten every forenoon and again in the afternoon, they all "go on strike for five minutes," throw open all windows, and relax or amuse themselves in any way they wished. They were all piece-workers and had had some doubts as to whether their earnings would suffer from this loss of fifty-five minutes a week. But the experiment had proved entirely successful. Hence the exuberant reception accorded him.

In the fourth article of this series the experience of another plant, which has been running under Industrial Democracy for six years, will be described. Some of the incidents illustrative of the solicitude of the workers for the welfare of the concern almost pass the comprehension of those who have never known anything better than the capital-versus-labor tug-of-war common to most corporations.—Copyright, 1919, B. C. Forbes.

Illinois Farmers Buy Agricultural Limestone in Train-Load Lots

THE FARMERS of Mason County, Illinois, recently ordered an entire trainload of agricultural limestone in one lot. The order was placed by the president of the county farm bureau, Charles Borgelt. According to a local newspaper report Mr. Borgelt has had an "idea for some time that a trainload could be bought, and arrangements made with the railroad company to dump it on the right-of-way and the farmer could haul it at his leisure.

"Mr. Borgelt says that to get this quantity would take about 15 weeks to haul it from the switch and the teams would have to be ready whenever the limestone arrived and if they were allowed to store would necessitate paying demurrage.

"F. and C. Borgelt are to take 10 to 15 cars of this shipment and Louis Hahn will take 5. They propose to have it dumped on the right-of-way where the C. P. & St. L. passes through Mr. Hahn's farm, and which is only half of a quarter of a mile from the Borgelt farm.

"The railroad company will make a charge of $55 per day for the train crew while it is being unloaded and Mr. Borgelt believes the trainload can be unloaded in one day. Should it take a few hours of the second day, it will cost another $55.

"Farmers are now real business men, and figure the costs of labor the same as a manufacturer."

New Limestone Consuming Industry for Ohio

TORONTO, Ohio—This city has been chosen as the location of the big steel plant which the Follansbee Brothers Co., Follansbee, W. Va., will build. The corporation will invest from $5,000,000 to $6,000,000. Fifteen acres will be used for the site and 1,000 skilled mechanics will be employed.

The plant buildings will include 1,500 open hearth and hot mills, 700 by 100-foot annealing department, 200 by 50-foot machine shop, 600 by 75--foot warehouse, 100 by 600-foot powerhouse, and 400 by 60-foot scrap shed.

There will be numerous other structures, including 300 dwellings for employes. A separate corporation will be formed to provide employes housing and the accompanying lighting facilities and water supply.

Central Michigan Sand and Gravel Prices Low

ALTHOUGH OPERATING expenses and the labor scale have increased in Central Michigan, there exists an abnormally low price for sand and gravel.

The Grand Rapids Herald states that it is because of lack of co-operation in a very destructive price cutting.

This is affecting the small producers far more than it is the larger ones.

All-Steel Rock Crushing Plant

Bethlehem Mines Corporation Furnishes Fluxing Stone for Steel Company and Also Makes Commercial Crushed Stone

By Brownell McGrew

A FEW YEARS AGO the Bethlehem Steel Corporation acquired a large block of dolomitic limestone directly across the Lehigh River from their immense steel plant at Bethlehem, Pa. In keeping with their policy of thorough development of their various quarry holdings, this company erected, during 1917-18, a modern crushing plant, and developed an old hand-loading quarry on the property into a steam shovel proposition.

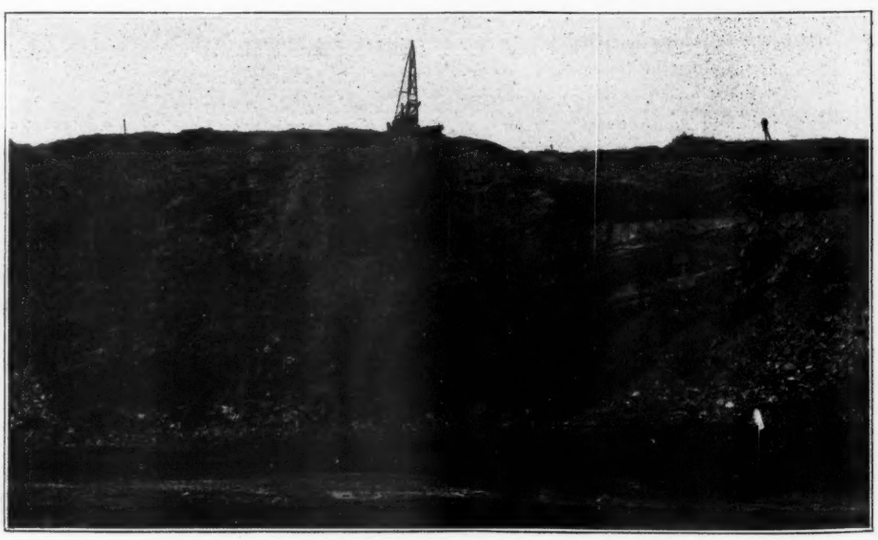
The crushing plant, though of moderate capacity, is notable for its excellent and permanent construction throughout; in fact, no expense was spared to make the entire development modern and up to date in every way. One of the interesting features is an aerial tramway, which transports the crushed flux stone across the river and deposits it in a 1500-ton storage bin, whence it is drawn by electric ore cars to the blast furnaces. Other installations, characteristic of the completeness of the equipment, are: a combined water treatment and storage plant, a permanent underground system of water and air pipe lines, and a first class building, in which are contained blacksmith shop, offices, storeroom, electrically driven air compressor, and transformer station.

Crushing Plant

The crusher house is of steel skeleton construction, with brick walls and a slate-shingle roof, the shingles being nailed to a "Pyrobar" sub-roof. The hoist house is of substantially the same construction. The screen house is constructed of steel throughout, the sides and roof being made of heavy sheet steel. All windows have steel sash, equipped with hinged ventilators and glazed with heavy wire-glass.

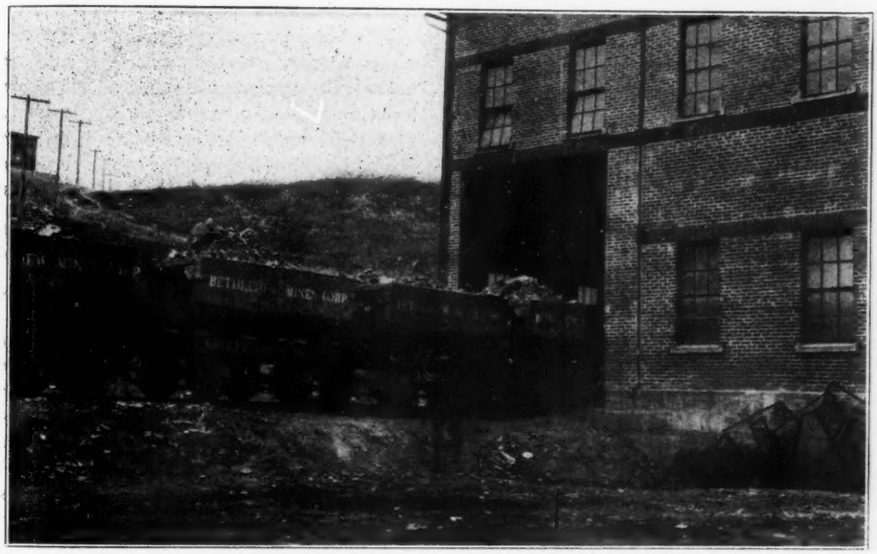
Crushing plant of Bethlehem Mines Corporation

Transformer station of Bethlehem Mines plant



Quarry, Bethlehem Mines Corporation, at Bethlehem, Penn.

Quarry operation, showing 100-ton steam shovel



Train of quarry cars at entrance to crusher house

Type of cars equipped with automatic couplers

The primary breaker is a 60x48-in. jaw crusher. It and the No. 8 gyratory rejections crusher are set side by side in a concrete-lined pit, and discharge into a common hopper underneath them, whence the stone is fed into the elevating skips. The two crushers are belted direct to individual motors of 150 h. p. and 100 h. p. respectively.

The gyratory crusher is so located that, in case of a breakdown on the jaw crusher, it may be used as a primary breaker, the quarry cars discharging into it from the same track that serves the larger machine.

An overhead electric crane of 20 tons capacity serves the double purpose of dumping the quarry cars and handling the crusher parts when it is desired to make repairs or renewals. The device which dumps the side-hinged quarry cars consists of two heavy hooks, suspended from an equalizer beam, attached to the crane hook. These hooks engage and disengage automatically from the cars, swinging back in the clear after each car is dumped. When it is desired to use the crane for other purposes, the dumping device may be detached in less than half a minute, and reattached in the same time.

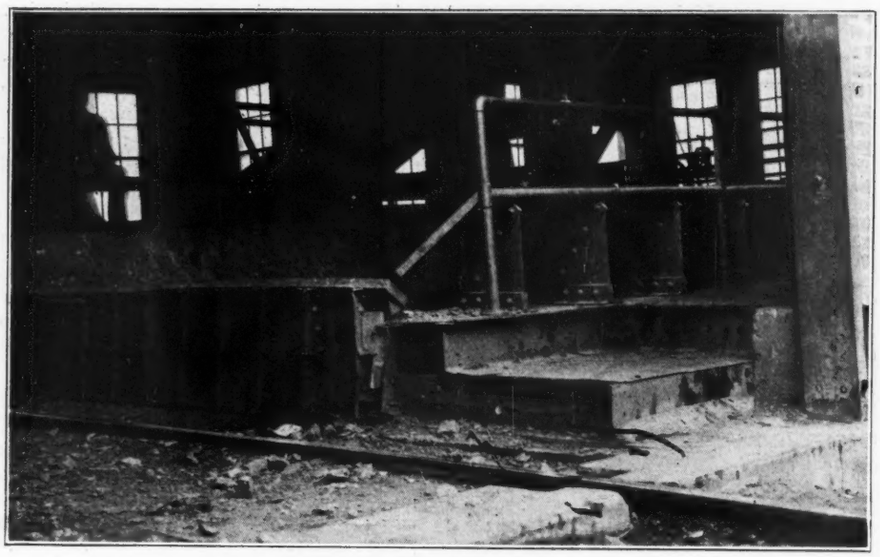
The semi-automatic skip system of elevation is employed. The skips are 8-ton capacity, and are actuated by a 125-h. p. single drum electric hoist; the starting, stopping and speed acceleration being taken care of by magnetic switches which are controlled by automatic series-relays.

Screening Plant

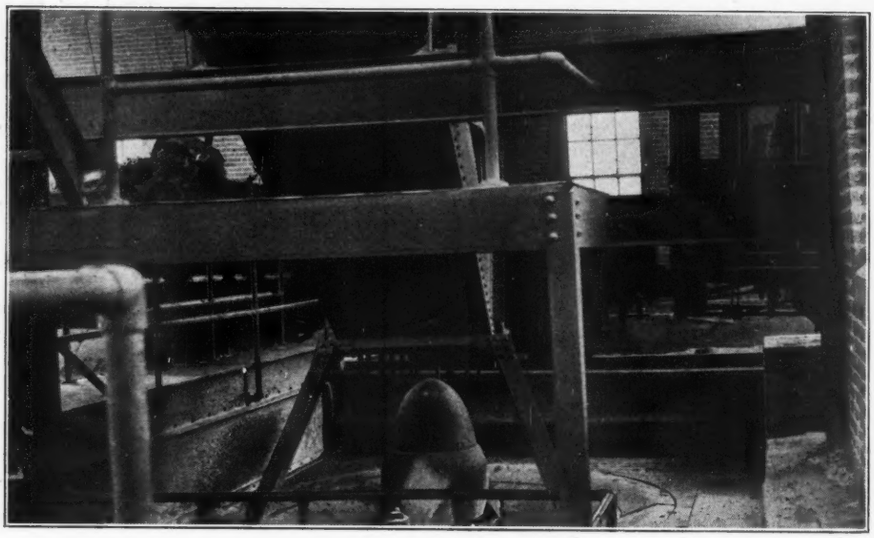
The skips discharge at the top of the screen house, into a large receiving hopper. From this hopper the material is fed by sling-feeders into a battery of three 60-in. by 24-ft. revolving screens. Half of the length of these screens is utilized to take the fine material out of the fluxing stone. The lower half is equipped with perforations of the proper size to separate the flux from the oversized product of the primary crusher. This oversize is discharged from the screens to a lateral conveyor, which takes the rejections from the entire battery.

This conveyor deposits its load on another belt, which carries the stone to the edge of the screen house, and discharges it into a long rejections chute that carries the material back to the crusher house and into the No. 8 gyratory. As mentioned before, the recrushed stone is discharged into the same hopper that the primary crusher discharges into; and is again elevated by the skips.

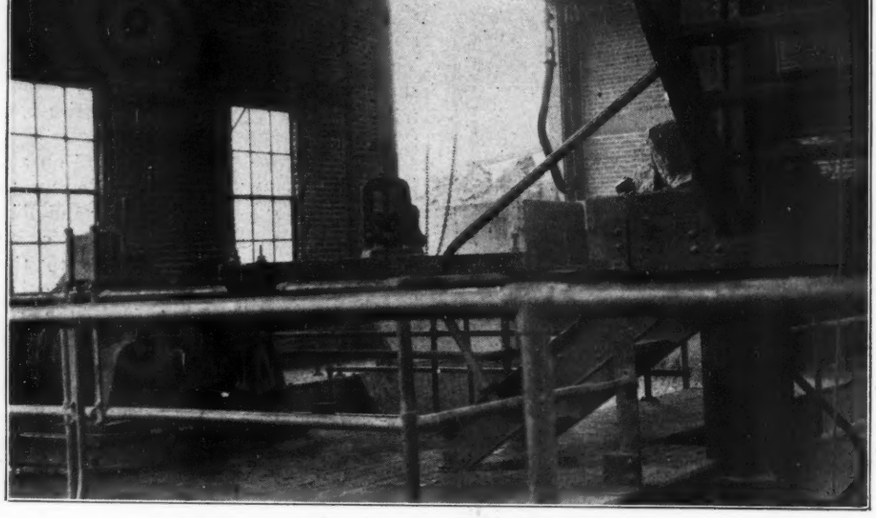
The fluxing stone drops from the screens into a storage bin, capable of accommodating 1500 tons of the material. The stone may be drawn from



Steel hopper setting of primary crusher



Section of No. 8 gyratory crusher



Electrically operated hoist for operating crusher hook

this bin, either by the tramway system or into railway cars.

The fine screenings drop from the revolving screens to a battery of three double-deck shaking screens, where these fines are separated into three sizes. Distribution from the shaking screens to the three storage bin compartments beneath them is accomplished by means of small belt conveyors and chutes. The small commercial sizes thus separated can be drawn from the bins into either railroad cars or trucks and wagons. There are also chutes, by means of which the largest of the three grades may be mixed with the flux when there is no commercial demand for it. As these small sizes are, in a manner of speaking, a by-product of the plant, the ultimate gain that will be effected by the installation of the shaking screens is obvious.

The revolving screens, shaking screens and conveyors are driven by a 100-h. p. motor; and the sling feeders are operated by a 7½-h. p. motor. The current used is 440-volt, 3-phase, 60-cycle.

The plant is equipped with a very complete system of electric lights, and an electrically-operated signal system, using bells and klaxon horns. A single-drum, motor-driven hoist is installed on the feed platform behind the main crusher to assist in the breaking of bridges in the receiving hopper.

Special Equipment

In the skip pit, beneath the crushers, two motor-driven pumps are installed. One of these—a volute centrifugal pump—takes care of the seepage through the foundation walls; the other—a geared three-stage pump—is connected to a pipe, extending through the concrete near the bottom of the pit; and this pump supplies the entire quarry, as well as the laborer's houses, with water.

The transportation equipment consists of 18, 6-yard, side-hinged dump cars, of exceptionally heavy and rigid construction, and 2, 20-ton, saddle-tank locomotives. The steam shovel is a 100-ton model. Motor-driven well drills are used for the drilling.

The loading terminal for the tramway system is a steel and concrete structure, located under the south bay of the screen house and storage bins. The stone is drawn from the bins to the tramway buckets through air-operated bin gates. The bin gates through which the flux is drawn into railroad cars, are also air-operated, while those under the bins containing the finer grades are manually opened and closed.

The maximum capacity of the crushing plant is between 250 and 300 tons per hour, and that of the tramway is around 200 tons per hour. Four or five men are required to operate the plant ordinarily; but, if necessary, it could be run for a time with three men. A crew

of six or eight men is required to operate the tramway to full capacity.

Single Roll Plant at McAfee, N. J.

The same company completed a crushing plant during the spring of 1919 on their large calcite holdings at McAfee, New Jersey. This plant, with a few exceptions, is a sister plant to the one at Bethlehem. The chief point of difference between the two plants is that at McAfee the primary breaker is a 36x60-in. Fairmount type single-roll crusher. Also, the McAfee plant is so arranged that the over-size material can either be sent back to the No. 8 gyratory for recrushing, or may be discharged into separate bins and shipped for open-hearth stone.

At this place, the company has erected its own power plant to supply electricity to the plant and quarry. This station is equipped with a 600-k. w. turbo-generator. The current generated is 2300-volt, 3-phase, 60-cycle. The steam plant consists of a B. & W. water-tube boiler, which delivers steam to the turbine at 200 lbs. pressure and 200 deg. superheat. In keeping with the rest of the quarry equipment, the power plant is modern and up to date in every way. Service pumps at the power house supply the quarry with water, which is first passed through a softening plant.

Both the Bethlehem and McAfee quarries are operated by the Bethlehem Mines Corporation, a subsidiary of the Bethlehem Steel Corporation. This company also operates quarries at Lebanon, Pa., Steelton, Pa., and Hanover, Pa.

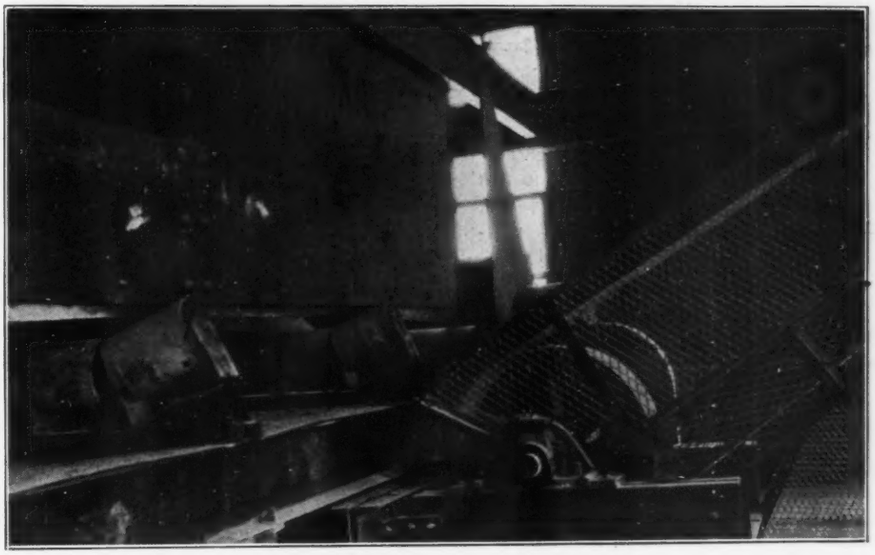
The two plants described were designed by Allis-Chalmers Manufacturing Co., who also furnished most of the plant equipment. The steel buildings were designed by the engineering force of the Bethlehem Mines Corporation, of which company W. S. Bourlier is chief engineer, and M. L. Jacobs, superintendent of quarries, is in charge of their operation, as well as the operation of the other quarries owned by the company. The buildings were fabricated and erected by the Heddon Iron and Construction Co., and the tramway at Bethlehem was designed and furnished by the American Steel & Wire Co.

Chicago Building Permits

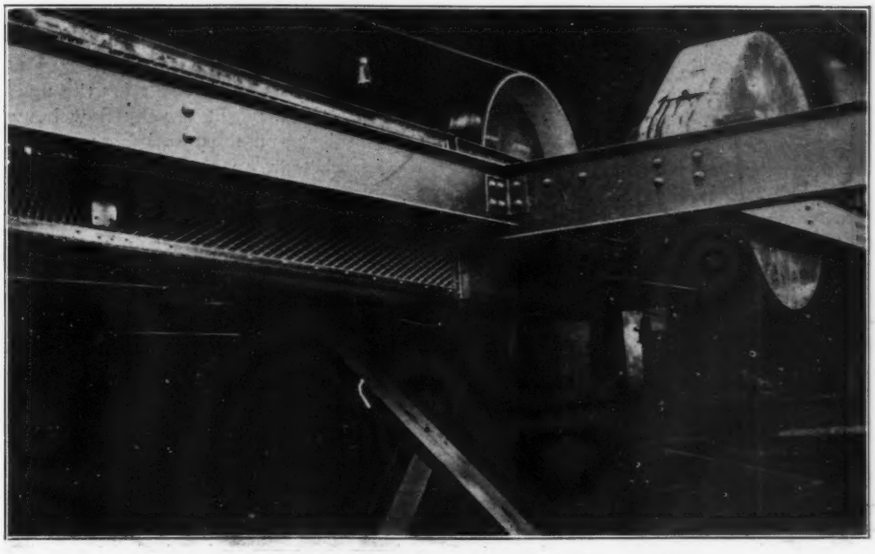
A GREAT many building permits have been issued in Chicago since recent settlement of the labor troubles; structures with a total valuation of $1,500,000 having been authorized in one day this week. It seems certain that there will be no let-up on certain classes of work during the winter, and that the volume of construction will be limited only by supply of labor and materials.

Chicago is in great need of many dwellings. It is estimated by transfer companies that 50 per cent of the people moving, store their furniture and go to hotels.

Looking down into primary crusher pit



Guarded belt drives in screening plant



Screen drives, showing steel construction of plant

Design of Large Rock-Crushing Plants

Part IV—Initial Breaking Plant—Scalping Screens

By Brownell McGrew

CRUSHERS, ELEVATORS AND CONVEYORS, and general problems of efficient design, have been treated in three previous articles (see ROCK PRODUCTS, August 30; September 13 and September 27). The following article is in a measure a supplement to the article on crushers in the August 30th issue, to which the reader is referred for more specific information on the particular advantages or disadvantages of each type of crusher.

Initial Breaking Plant

Naturally, in choosing the size of the primary crusher, the element of capacity is the first factor. The figures given in the manufacturers' catalogues are conservative, and can be relied upon. Where the figures are given for a certain opening, capacities for larger or smaller openings can be estimated, basing the calculation on the fact that it will increase or decrease very nearly in proportion to the area of the discharge opening.

Capacity alone should never be the deciding factor in selecting the size of the breaker to go into a large crushing plant. It should be remembered that a crusher cannot break stone unless it can get hold of it. A No. 12 gyratory crusher, on hand-loaded stone will turn out upwards of 500 tons per hour on a coarse setting. It will, in some quarries, come close to this figure on shovel loaded material; but there are other quarries where it would not do 200 tons per hour with the latter method of loading. When the structure of the stone is such that it shoots out in massive blocks, there is no crusher made that will not be blocked at times, if the steam shovel is used as a loader. Quarrymen know this. Naturally, though, the larger the machine the less blocking there will be. That is one advantage of the big crusher. Its greatest advantage, however, lies in the cutting down of quarrying cost. For one thing, it cuts down secondary shooting, which is one of the costliest operations of quarrying. It lessens delays at the shovel while this shooting is being done. The writer has seen more than one quarry where, on certain days, the delay on account of plug drilling and shooting in front of the shovel ran as high as 75 per cent of the time. He has seen quarries where the installation of a big crusher would have eliminated the use of at least one steam shovel, an a considerable amount of rolling stock and motive power.

These things, more than mere capacity, should govern the size of the primary breaker to be installed. It is not always necessary to put in the largest crusher built; nor it is always advisable. Some stone does not require it. But it is better to have a little more crusher than you need than it is to have a little less.

The feature of saving in quarry equipment will apply in some instances to the placing of the primary breaker. The first cost of a pit foundation in which to place the machine will, for some locations, be very high. But, once in, the foundation is there forever. On the other hand, quarry equipment wears out; repairs and replacements are a constant item of expense. The labor cost of operating incline-fed plants is higher than in the pit type; and the latter type is certainly susceptible of a higher rate of feed.

Receiving hoppers over the main breaker should be of simple, strong and accessible design. The bottom may be constructed of steel, or the box chute principle may be used, allowing the stone to form its own hopper. The latter method recommends itself as eliminating the cost of liner replacements, but requires a somewhat steeper pitch, and consequently more headroom than the former. A mistake, commonly made in the design of the steel hopper, is that of not making the bottom thick enough. For heavy stone it should not be less than 2 in. thick—and heavily reinforced. Care should be exercised in designing the hopper to insure that there are no shoulders or other obstructions to interfere with the free passage of the stone.

The writer believes it unnecessary to provide a mechanical feeder for the main breaker; the straight gravity flow being the simplest and most satisfactory. The wear and tear on equipment, handling the big run-of-quarry stone is naturally heavy, and the less equipment that this stone comes in contact with before reaching the crusher, the better. It is true that the discharging of the entire load at once, as is necessary with some types of quarry cars, will sometimes cause bridging over the receiving opening; but if proper provisions are made for the breaking of these bridges, there will not be much delay on that score—and a stone that is too large will block the machine, anyway. The use of side-hinged dump cars eliminates bridging to a large extent, as the device by which these cars are dumped can be so regulated that the load will be discharged gradually. The same may be said of the skip type of car, used with the double slugger rolls.

The secondary crusher is, of course, not always a necessary adjunct to a crushing plant. Neither they nor the final re-crushers are necessary if there is a market for the largest sizes produced by the primary breaker. Nor will the secondary be essential when the size of the initial crusher's output is such that the majority of it will grade under the maximum size of product desired—in which case the screen rejections may be reduced by rejections crushers.

The combinations of initial and secondary machines that may be selected, is manifold. It is not necessary that the two crushers be of the same type; nor is it always advisable, as for instance, when the jaw crusher is employed as a main breaker. As a secondary, this type of machine has the same disadvantage that militates against its use as a re-crusher.

An excellent combination of machines for hard rock reduction is that mentioned under the heading of "Jaw Crushers"—namely, the big jaw operating in conjunction with a gyratory. On limestone, the single roll would make an excellent secondary machine in combination with any of the types of primary breakers. Double rolls as secondary crushers may also be used with any of the types of main breakers.

Where fine reduction is an essential, as in cement rock plants, the secondary units may be multiple. An example of this is the plant of the Edison Portland Cement Co., where three secondary machines are installed in tandem under the slugger rolls. The same principle is adhered to in the Tompkins Cove crushing plant. In the latter plant, the final unit of the secondary bank also serves the purpose of a rejections crusher, the oversize from the screens being returned to it for further reduction.

To realize the full capacity of the main breaker, it will generally be necessary to install more than one secondary machine, depending upon the combination selected, and the product desired. That is, instead of the tandem idea above mentioned, a battery of crushers, installed "in parallel" may be employed—the size and number being governed by required capacity and product.

When the capacity of the secondary units is much lower than that of the main breaker, as will often be the case, ample provision for storage should be

made between them and the big machine, in order that there may be no delay in crushing the trains of stone as they come in from the quarry. Thus the smaller crushers can utilize the time between trains in getting rid of their load.

Often the ground conditions are such that it is not practicable to place the secondary crusher below the initial machine. If such is the case, the smaller unit, or units, may be placed in the most convenient position, and the stone elevated to it, or them, from the first crusher. Since the introduction of steel and concrete into crushing plant construction, it is entirely feasible to place the secondary units in the top of the screen house. Or they may be placed at an intermediate point, and a double system of elevation used. The simplicity and operating efficiency of the former method will be particularly manifest when the skip system of elevation is installed. Naturally, the cost of the supporting structure will be higher than if the crushers are located close to the ground.

Scalping Screens

Where secondary crushers are installed between the main breaker and the separating and re-crushing plant, the question arises as to whether or not scalping screens between the two units are advisable. In its solution the designer should be guided by the size of the product of the main crusher, and its relation to the product of the secondary crusher. When the big main breakers are set to a large discharge opening their product will range from fine spalls to one and two-man stone. To repeat the assertion made in connection with mechanical feeders: the less equipment this stone comes in contact with, the better. If any scalping is done on stone of this size, it should be done over heavy grizzlies.

If, however, the product of the main breaker ranges from about 8-in. ring down, and a third, or more, of it is below the grade which the secondaries are expected to produce, the use of revolving screens for scalping is generally advisable, as they will cut down the amount of material to be handled by the crushers, and hence, admit of fewer or smaller crushers.

Elevation

Little of value can be said upon the subject of elevation beyond what has already been said under the heading of "Elevators." By studying the characteristics of the different types, the designer will be able to select that type which is best fitted to local conditions, and to the needs of the rest of the plant. In any event, he should not allow his affection for any particular type to influence him, to the detriment of the effective location of the initial breaking plant, nor of the screening and re-crushing units. If you are addicted to a certain system of elevation, and you feel that it will fit in with the balance of the plan, by all means, use it. There is less chance of going astray here than at any other point of the layout.

[The succeeding article will take up the separation of sizes and the distribution of the material in the plant.—Editor]

Talc Plant Enlarged to Keep Pace with Demand

IN ORDER to keep pace with the increased demand and use of pulverized soapstone (talc)—sometimes called steatite—the Franklin Soapstone Products Corporation of Henry, Va., has just completed the installation of additional drying and pulverizing machinery which gives the company a capacity of about five times what it had one year ago.

The entire plant has been re-built and brought strictly up to date, giving the company the largest pulverizing capacity of any talc mill in the world. The additional pulverizers and dryers were furnished by the Fuller-Lehigh Co., while the Stephens-Adamson Mfg. Co. largely furnished the balance of the equipment.

While the work of increasing the mill capacity was in progress, additional face was opened in the company's quarry, which virtually exposes a mountain of soapstone. After being brought down to the mill and crushed to a 1-in. ring, it is pulverized to varying finenesses, from 40 to 350-mesh.

To many persons, soapstone uses mean only those uses to which slab soapstone is applied, such as hot plates, foot warmers, and metal workers' crayon. Such persons do not know that pulverized soapstone is largely used by all the large rubber manufacturers, paint, roofing manufacturers and foundries.

White talc is rapidly being replaced, on account of cost, for manufacturing and mechanical purposes by blue, gray, cream and yellow talc, which are found in greater quantities, and are equally as good as the white for such purposes.

For foundry facing purposes, talc is steadily replacing plumbago and charcoal because of their tendency to float. —C. O. Kiton.

Money Available for Federal Aid Roads

IT IS REPORTED that of the $80,000,000 available for Federal Aid road building, only $3,573,937 had been expended by July, 1919. Since there will be $95,000,000 more available during the fiscal year ending July, 1920, a grand total of $171,426,062 will be at hand.

At the present rate of construction, however, this will not be used up by July, 1920.

Fuller's Earth

AT LANCASTER, MASS., occurs a deposit of fuller's earth, which has been worked intermittently since 1856. While this earth possesses most of the properties common to other fuller's earths it has the additional characteristic of breaking down upon drying, and without crushing, to a closely uniform, fine product, free from grit, which will pass through a screen of about 250-mesh. While this property makes the material unfit for some uses, such as a filtering medium, it is peculiarly well adapted to certain other uses.

In the fulling of woolen cloth uniformity, fineness, and freedom from grit are essential, for grit or pebbles abrade and cut holes in the cloth as it passes over the rolls. Fuller's earth not only removes any grit remaining in the wool, but helps to flow the dye uniformly over hard-finished woolens. The earth from this deposit has been used in the woolen industry for over 60 years.

Another use has been developed in recent years dependent not upon its absorbent action, but upon its value as a binder when fused. Manufacturers of abrasive wheels and stones made both from natural and from artificial abrasives, have used this earth as a binder. It fuses at Seger cone No. 2.

The deposit lies nearly horizontal and is covered with a bed of gravel 2 to 2½ feet thick. The earth is stratified and varies in thickness from 2½ to 20 feet, averaging about 15 feet. By small test pits reserves of 25 to 30 acres have been developed.

In mining the earth the stripping is first removed by wheelbarrows over a small area. Then the clay is cut down with picks and mattocks in benches about 5 feet high, loaded into wagons, and either hauled to the railroad siding or to a drying plant. A very small area is stripped ahead of mining and low benches are used so as to minimize the danger of gravel slumping or being washed by rain into the good material.

Earth for abrasives manufacture is shipped in bulk, without drying; that for fulling must be dried and shipped in sacks or barrels. Drying is done under sheds or iron plates under which hot air from a coal or wood fire circulates. From wagons the earth is shoveled into sheds for storage, then shoveled onto the drying plate. After thorough drying the earth is shoveled into dry storage bins, where it is sacked or barrelled, and is then hauled by wagon to the railroad.

It is thought that much more extensive uses for this material might be developed by a thorough study of its chemical and physical properties.—By R. B. Ladoo, U. S. Bureau of Mines.

Hints and Helps for the Plant Superintendent

Rugged Gravel Screens

THE ACCOMPANYING illustrations show a type of gravel screen which the Coon River Sand Co., Des Moines, Ia., constructs at its own plant shops.

The three-arm yokes are cast iron, made at a local foundry. They are of very rugged construction, as the views show, but they are well balanced and certainly give the screen stability.

The screen proper is made of one, two or more sections of perforated metal plates, bent to the proper radius. The single longitudinal joint is made by a plate bolted to the inside of the screen. The perforated plates are bolted to the yokes in two places only, near the ends of ribs or rims of the yokes. Each rib or rim includes an arc of about 60 degrees.

The general manager of the Coon River Sand Co. is R. Snoddy.

Unloading Gypsum

THE IRONTON PORTLAND CEMENT CO., Ironton, Ohio, has found a very proficient method of unloading and handling bulk gypsum to their storage bins.

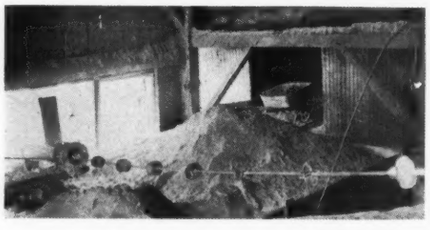
The view shows the discharge end of the conveyor at the storage bin. The material is handled from the cars into a small hopper out in the yard.

At the bottom of the hopper is the open end of a 6-in. pipe, which extends up to the storage house. The material, falling to the bottom of the hopper, is caught by lugs on the cable which runs through the pipe and is transported to the bin.

The conveyor cable runs over pulleys at either end of the course, and operates on the principle of an endless belt. One pulley is driven by a gear and motor, thus pulling the cable through the pipe. The experience of this company has proved this to be a very good method of handling such a dusty material.

The advantages for this device are claimed to be that it enables the car to be filled to capacity; it is much faster than a hand method; it removes all fine dust from the material, and it costs only 8 cents per ton to load.

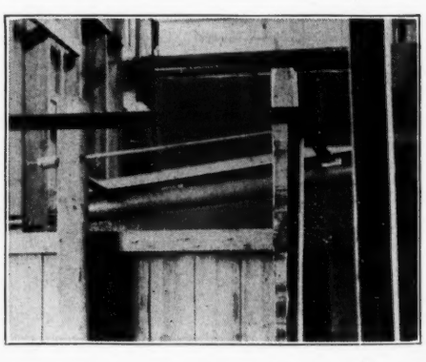
T. C. Brownstead is mechanical engineer of the Ironton Portland Cement Co., and superintendent in charge of operations.



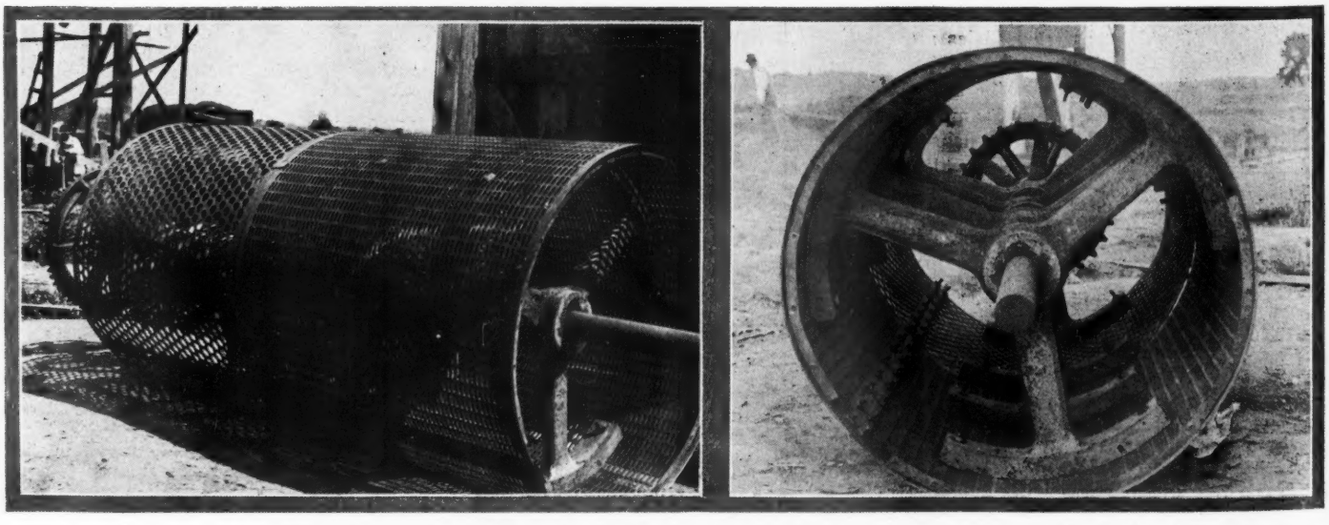
Gypsum conveyor at storage bin

Device to Clean Screens

THE UNITED FUEL AND SUPPLY CO., at their Oxford, Mich., plant, have a very efficient and home-made method of keeping their screening surface free from pebbles. It is illustrated in the accompanying cut and is made in their machine shop. A cast iron roller 3½ in. in diameter and the length of the screen is used. The ends are turned down to form a bearing for two supporting arms. These arms are fitted to the roller loose enough to permit it to turn with the screen and yet hold the roller in its position. The other end of the arm is so fastened as to allow it a motion in a vertical plane. Thus the roller may rise and fall if the screen is not exactly round.



The roller rests on top of the screen



Rugged gravel screens used by the Coon River Sand Co., Des Moines, Ia.

Hints for Hoist Operation

HOISTS ARE BUILT to stand hard work and hard usage; but, like all other machines, they need some attention if they are to do the best work of which they are capable. Run them to the limit of their capacity; they are built to stand it, but take decent care of them.

Boiler Hints

1. Firing up too rapidly when the boiler is full of cold water will result in leaky tubes and seams.
2. Flues should be cleaned once a week or the boiler will not steam properly.
3. Blow-off a gauge and a half of water once a day at 60 lbs. pressure.
4. Clean boiler thoroughly once in two weeks.
5. Bad water can be partly counteracted by the addition of a pint of kerosene when filling. If no kerosene can be procured, a few potatoes will help keep the scale off the tubes.
6. Up-and-down brace rods must not be tightened up when boiler is cold, or expansion on heating will break the rods.
7. To prevent steaming close stack and ashpit dampers and bank fire with green coals; in this way steam will hold for hours at a time. Don't open the fire box door to prevent steaming; the cold draught will cause leaky flues.
8. Gauge-cocks should be tried for water before steaming up. See also that there is water in the glass.

Engine Hints

1. Cylinder cocks must be opened before starting engine after it has been standing for some time; failure to do this will result in a loose piston or the knocking out of a cylinder head.
2. Oil the bearings and cylinders regularly; oil is cheaper than grief.
3. Tighten bolts and nuts as soon as they begin to work loose. Do it with the wrench provided, not with a hammer.
4. Open drain-cocks and drain lubricator before leaving engine at night; otherwise, in cold weather, your engine will be frozen solid when you come back in the morning.
5. Do not alter the valve-gear on a new engine. Before leaving the shops it is set by a valve-expert to give the greatest possible efficiency and no adjustment of any kind is necessary.

Drum Hints

1. Tighten spring-bridle nuts to ⅛-in. from gear when friction is set; this will allow the drum to revolve freely on the shaft when friction is released. If this is not done, the spring-bridle will cut into the drum.
2. Grease-cups on drums are large enough to supply grease for a 10-hour run if screwed down occasionally. Be sure to fill them every day.—From "Successful Methods" for October.

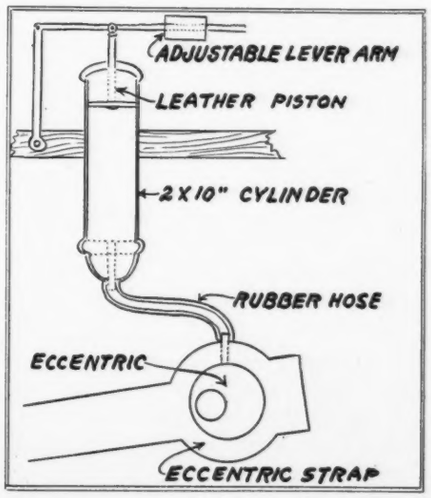
An Automatic Grease Cup

A. E. FREEMAN, superintendent at the North Baltimore, Ohio, quarry of the France Stone Co., uses an automatic grease cup on the eccentrics of the shaker screens to great advantage. Any moving part of machinery which must stand a heavy load for long intervals requires close attention as to lubrication. And so instead of risking this job to a man, this little device was perfected to do the work.

It consists of a 2-in. cylinder 10 in. tall, with a ½-in. connection at the bottom; to which is attached a hose. The hose is fastened to the eccentric in such a manner that when the eccentric moves, the hose will bend.

The cylinder is filled with grease and a piston rod with a leather piston on one end is put in place. A cap, which is screwed onto the cylinder, serves to keep dust out and to hold the piston rod upright. A lever arm with an adjustable weight on one end furnishes the required pressure to slowly force the grease down through the hose to the eccentric. The adjustable lever arm enables a correction to be made for change of temperature.

With the exception of filling every two or three days, the eccentric receives no attention; whereas, before this cup was used there was considerable trouble because the engineer would forget to come around and screw down the grease cups.



An automatic grease cup as used to lubricate an eccentric

Safety Catch on Stone Elevator

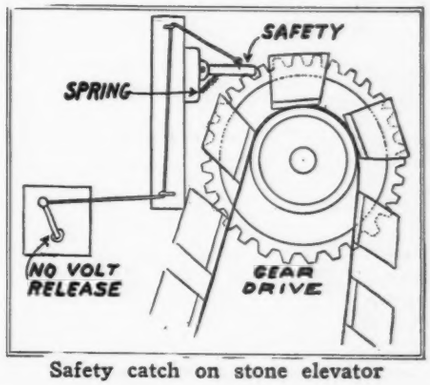
THE DOLOMITE PRODUCTS CO., Maple Grove, Ohio, which is a very complete electrically equipped plant, has experienced some difficulty in the loss of power for several minutes at a time.

When a power failure occurred with the elevator full of rock, the weight would cause it to run backwards, depositing the rock in the pit. Several hours would be required to dig this out, during which time all hands were idle.

Peter Harison, quarry superintendent, conceived of the idea here illustrated, to prevent such an occurrence when the power failed.

It is merely a safety on the main drive gear at the head of the elevator, held away from the teeth by a cord from the no voltage release switch handle.

In case the power fails, the no-volt release flies across, loosening the cord, thus permitting the safety to fall into place. Since the installment of this safety, Mr. Harison says that there has been no trouble when the current fails.



Safety catch on stone elevator

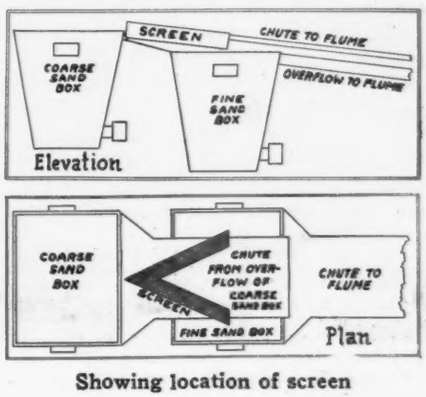
Sand Separation Device

THE ACCOMPANYING plan and elevation drawings will give a better idea of the location of the special made screen referred to in an article on Sand Separating Device, page 30 of the September 13th issue of ROCK PRODUCTS.

All of the sand and water comes down a chute and enters the coarse sand box. Right in the mouth of the overflow of this box is the v-shaped screen referred to.

Part of the material from the coarse sand box passes through this screen and on down the flume, and part is diverted into the fine sand box.

This method of removing part of the very fine sand before it gets to the fine sand box increases the capacity of that box and also reduces the percent of undesirably fine sand.



Showing location of screen

Specifications for Sand and Gravel

First Article—Sand for Plaster—Mortar for Brick Laying—Concrete Aggregates

PREVIOUS ARTICLES, published each issue since August 2, have described the origin and properties of sand and gravel. Beginning with this article will be a series describing the various uses of sand and gravel and the specifications or requirements for each. This series of articles, like the preceding one, is based on "The Sand and Gravel Resources of Missouri," by C. L. Dake, of the Missouri Bureau of Geology and Mines.

Mortar for Plastering

In selecting a sand for plastering purposes, cleanness, size of grain, sharpness and color are properties of sufficient importance to warrant inspection. In discussing specifications for mortar sand, Condra[1] says:

"All sand used for mortar should pass a No. 10 sieve and 80 per cent of it should be retained upon a No. 74 sieve. It should be a silicious sand, as sharp as can be obtained within reasonable limits of cost. It should be free from all vegetable or organic matter, and should not contain more than 10 per cent by weight of clay or loamy material."

Cleanness is one of the most important properties to be desired in a good sand for plastering. It has already been shown that clay in moderate amounts is not harmful in sand for concrete work[2] unless it occurs in the form of a coating on the individual grains, in which case it prevents proper adhesion of the cement or lime to the sand grains. Sand in which the grains are so coated should be washed.

In plasters for the interior of reservoirs and other structures where waterproof finish is desired, clay in small quantities (under 10 per cent) has been found desirable.[3]

The presence of vegetable matter in the form of humus coating the grains of sand, has the same effect as clay[4] and renders a sand unfit for use in the best work. Peat or lignite in the sand has no apparent effect upon the strength of mortar, but is highly injurious to plastered walls, since it causes the surface of the plaster to pop, leaving small pits.

Size of grain is also of considerable importance in plastering sand. There should be no grains of greater diameter than the thickness of the desired coat of plaster, since they would interfere with the spreading of the mortar, and leave an irregular surface. All grains should pass a 10-mesh sieve, according to Condra.[5] A preponderance of very fine grains is also said to be undesirable, since the plaster does not "clinch" well behind the lath, but "falls through." A fine sand is also more difficult to mix. According to the same authority, 80 per cent of the sand should be retained on a 74-mesh sieve.[6]

A sand of graded grains has a lower per cent of voids, and hence requires less lime or cement, than an ungraded sand, and has a greater strength.[7] This feature is of less importance, however, in plaster work than in concrete aggregate, since the mixture used in plastering contains no coarse aggregate at all and the opportunity for grading is consequently much less.

Sharpness is a property universally demanded in specifications in the past, but recent tests seem to show that its importance has been highly over-emphasized. The Bureau of Standards reports that round sand is as good as sharp sand.[1]

Color is of very little importance, except in finishing coats, where great whiteness is desired. For practically all ordinary work any sand is satisfactory in color.

Mortar for Bricklaying

What has just been said about mortar for plastering is true in general of mortar for bricklaying with only slight modifications. Since mortar in brick work is forced, as a rule, to undergo greater strain than in plaster work, strength is here an item of greater importance. Films of clay or organic matter on the grains are to be guarded against even more carefully than in plastering work. Small amounts of clay evenly distributed through the sand are not harmful. Lignite is less harmful in a solid wall than on a plastered surface, since there is less surface to undergo the popping described above.

Size of grain is important. No pebble in the sand should have a diameter as large as the mortar joint, which usually runs from ¼ to ⅜ of an inch. Up to this limit, however, the coarser the sand, the stronger the mortar, according to principles already laid down. A graded sand is to be desired, since it requires less cement or lime and yields a stronger mortar.[2]

Sharpness and color are apparently matters of little consequence in mortar for brick work.

Mortar for Stone Masonry

Mortar for stone masonry follows closely the specifications of that for brick laying. Since the joints are usually thicker than in brick work the size of pebbles allowable in the sand is somewhat greater. Lignite is even less harmful than in brick laying. Other factors of cleanness and size tending to influence strength of mortar are equally important in either kind of work, and color and sharpness are negligible.

Sand and Gravel for Concrete Aggregate

By far the greater proportion of the sand and gravel used in the structural trades is employed in concrete work, and consequently properties required in a concrete aggregate are outlined in some detail.

The following summary of properties desirable for good concrete aggregate is quoted from Taylor and Thompson.[1]

Tests of the sand, unless it comes from a bank which has been previously tested, are as necessary as tests of the cement. (159.)

Even a small amount of vegetable matter in sand prohibits its use. (154b.)

Fine sand, even if free from vegetable matter, makes a much weaker concrete than coarse sand. If it is necessary to use fine sand, therefore, the proportion of cement should be increased. (136, 159a.)

If the grains are mostly less than 1/32-inch in diameter, nearly double the amount of cement should be used than with an equally clean sand having mixed grains running up to ¼ inch, in order to obtain equal strength. (159a.)

For unimportant work, fine sand, if clean, may sometimes be used, but it is usually cheaper to import a coarse sand and use leaner proportions. (149, 159a.)

COARSE AGGREGATE

If the stone contains dust, it must be uniformly distributed throughout the stone, and the proportion smaller than ¼-inch should be determined by test and considered as sand when proportioning. (34.)

Soft stone should be avoided in important structures. (390.)

Gravel if used, must be clean, that is, the particles must be free from coating of vegetable matter or clay which will retard the setting or prevent the cement from sticking to the pebbles. (34, 386.)

Gravel can be washed satisfactorily only with special apparatus. (250.)

Among the properties to be considered in discussing the value of a given sand or gravel in concrete construction, the following have been thought to be of sufficient importance to warrant specific consideration: cleanness, size of

[1] Condra, G. E., The sand and gravel resources and industries of Nebraska; Nebraska Geol. Survey, vol. III, pt. 1, p. 150, 1908.

[2] Sabine, L. C., Cement and concrete, 2d ed., p. 182, and p. 271, 1907.

[3] Taylor, F. W., and Thompson, S. E., Concrete, plain and reinforced, 2d ed., p. 343, 1911.

[4] Taylor, F. W., and Thompson, S. E., op. cit., p. 154b and 154c.

[5] Condra, G. E., loc. cit.

[6] Condra, G. E., op. cit., pp. 150 and 152-153.

[7] Condra, G. E., op. cit., pp. 149-150.

[1] Circular No. 45, p. 36, 1913.

[2] Taylor, F. W., and Thompson, S. E., Concrete, plain and reinforced, 2d ed., p. 205, 1911.

[1] Concrete, plain and reinforced, 2d ed., pp. 1a-2a, 1911. The numbers in parentheses refer to the pages in the above treatise, where these properties are discussed in detail.

grain, volume of voids, shape of grain, smoothness of grain, strength of aggregate.

Cleanness in concrete aggregates—It has formerly been believed that the presence of clay in concrete aggregates was undesirable, and that to secure the best results aggregates carrying clay should be washed or screened or both, before they are used. In modern practice, it is believed that clay in moderate amounts is not harmful; in fact, clay is now sometimes added to increase the plasticity, to increase the ease in tamping the mass, or to render the mortar stiff that it may withstand early immersion.[1] One of the results of the presence of clay is to retard the setting of the concrete. With natural cement, ten per cent of clay produces a marked retardation, while with Portland Cement, larger amounts are necessary before the action becomes appreciable.[2] Concerning the strength of the concrete, the same writer concludes that clay in quantity up to at least 6 per cent of the aggregate increases the strength of Portland concrete, while natural cement concrete is not appreciably affected.[3] Clay to the amount of 10 to 25 per cent of the total may be added to lean mixtures of Portland concrete, thereby increasing its strength and its ability to withstand early immersion.[4] It is generally believed that argillaceous matter should be avoided in concrete that is subject to action of sea water.[5] Pure clay has been found to have a certain value in rendering concretes and mortars waterproof.[6]

The presence of organic matter in aggregates is universally condemned. Sabin says:[1]

> There seems to be no doubt that loam, peaty matter or humus will very materially decrease the strength of mortars, or even destroy them entirely.

Taylor and Thompson say:[2]

> When the impurities are of an organic nature, like vegetable loam, they frequently have been found to prevent the mortar or concrete from hardening or to retard the hardening for so long a period as to make the sands entirely unfit for use. A very minute quantity of vegetable matter may produce injury, so small a percentage in fact that frequently a sand which has passed careful inspection fails in practice to set properly with any brand of cement; therefore a test is absolutely necessary for any sand which has a suspicion of organic matter.

Speaking of the fall of a concrete building, the authors go on to say:

> The cause of the failure was traced in the expert investigation, to vegetable impurities in the sand which had washed down into the bank from the soil above. The poorest sand *** showed by mechanical analysis only 4% by weight of fine material passing a No. 100 sieve and 1.61% silt by washing, but this silt was found to contain nearly 30% of vegetable matter corresponding, however, to only 0.5% in the total sand. The vegetable matter appeared to coat the grains of sand so as to prevent adhesion of the cement and also retard the setting.

The above statement seems to be meant to apply only to humus substances. Whether or not coal or lignite, which are much more nearly inert, would have the same effect, is doubtful. That the lignite in Missouri River sands causes the "popping" of the cement or plaster surfaces, as already described, is well attested by observations. The writer has, however, been assured by many dealers and by a few builders that the lignite in the quantities usually present is not harmful in a solid mass of concrete or masonry, but he has not been able to find any scientific data on the point in question. No tests for organic matter have been made on the sands examined for this report.

The following specifications regarding cleanness are essentially those adopted by the joint committees on Concrete and Reinforced Concrete (1900) and the report of the Reinforced Concrete Committee (1909) of the National Association of Cement Users.[1]

> The gravel shall be composed of clean pebbles free from sticks and other foreign matter and containing no clay or other material adhering to the pebbles in such quantity that it cannot be lightly brushed off with the hand or removed by dipping in water. It shall be screened to remove the sand, which shall afterward be remixed with it in the required proportions.

According to the Bureau of Standards[2] the presence of organic matter, sulphides, and soluble alkalies are to be avoided in a sand or gravel. From the mode of formation of sands, it follows naturally that most sands will be free from sulphides and soluble alkalies, because they would weather out in the process of formation. They are more apt to occur in crushed rock aggregate. Organic matter, however, is often present in sands.

Size of grain in concrete aggregate—The principle has already been emphasized that in a general way the larger the size of grain in an aggregate, the stronger the resulting concrete, because each individual grain has a larger surface to which the cement may adhere.[3] The coarsest particles, however, should not be large enough to separate from the mortar during laying, nor to prevent the concrete from fully surrounding the reinforcement or filling all parts of the forms. For use in large masses, pebbles up to 3-in. are allowable. For reinforced work, they should usually pass a 1-in. ring.[4] Even large bowlders may be laid in heavy concrete walls without detriment, if only they are perfectly bedded in the concrete and not set too close together.[5]

It has also been found by actual experiment that fine sand requires a larger percentage of water in gaging than does coarse sand; when moist it has a higher percentage of voids and consequently a less density, because the grains are separated by a water cushion. For that reason, very fine sand requires a higher proportion of cement to make a proper mixture.[6] The following recommendation was made by the Reinforced Concrete Committee of the National Association of Cement Users.[1]

> The relative strength of mortars from different sands is largely affected by the size of the grains. A coarse sand gives a stronger mortar than a fine one, and generally a gradation of grains from fine to coarse is advantageous. If a sand is so fine that more than 10 per cent of the total dry weight passes a No. 100 sieve, that is, a sieve having 100 meshes to the linear inch, or if more than 35 per cent of the total dry weight passes a sieve having 50 meshes per linear inch, it should be rejected or used with a large excess of cement.

According to the Bureau of Standards (Circular No. 45) fine aggregates should pass a ¼-in. mesh screen.

A knowledge of effective size and of uniformity coefficient is of considerable value in getting a conception of size and voids of any particular sand. Since, in general, coarse sands are less uniform in size than fine, it is rather generally true that the larger the uniformity coefficient, the coarser the sand and the better for concrete work. A sand with a coefficient above 4 or 5 is a good coarse sand for this type of work.[2] However, a sand with even a moderately low coefficient may be used if the effective size runs high.

Voids in concrete aggregate—As all voids in the coarse aggregate may be considered filled with the mortar (itself a mixture of sand, water, and cement), it becomes apparent at once that the lower the percentage of voids in the gravel aggregate, the less cement will be required in the mixture to give the same strength. Actual tests show that a thoroughly graded aggregate gives a conconcrete with an increase of about 14 per cent of strength and a decrease of about 12 per cent in the cement used over the same materials ungraded.[3]

As has been previously shown, the lowest percentage of voids is to be secured by such a grading of aggregates

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[1] Sabin, L. C., Cement and concrete, 2d ed., p. 267, 1907.
[2] Loc. cit.
[3] Op. cit., pp. 319-320.
[4] Op. cit., p. 271.
[5] Op. cit., p. 364.
[6] Taylor, F. W., and Thompson, S. E., Concrete, plain and reinforced, 2d ed., p. 343, 1911.
[1] Cement and concrete, 2d ed., p. 182, 1907.
[2] Concrete, plain and reinforced, 2d ed., pp. 154b-154c, 1911.

[1] Taylor, F. W., and Thompson, S. E., Concrete, plain and reinforced, 2d ed., p. 34, 1911.
[2] Circular No. 45, pp. 35-36, 1913.
[3] Sabin, L. C., Cement and concrete, 2d ed., pp. 173-174, 1907.

[4] Taylor, F. W., and Thompson, S. E., op. cit., p. 43, 1911. Specifications of the Joint Committee on Concrete and Reinforced Concrete (1900) and the Report of the Reinforced Concrete Committee (1909) of the National Association of Cement Users.
[5] Sabin, L. C., op. cit., p. 374, 1907.
[6] Taylor, F. W., and Thompson, S. E., op. cit., p. 147, 1911.
[1] Taylor, F. W., and Thompson, S. E., op. cit., p. 159a.
[2] Op. cit., p. 182.
[3] Taylor, F. W., and Thompson, S. E., op. cit., p. 205.

that all the voids of each sized grain contain the largest particles that will enter them.[1] To secure approximately this condition in sands, Feret[2] has screened sand into,

Coarse 5 mm. — 2 mm. (0.20 — 0.079 in.) diameter.

Medium 2 mm. — ½ mm. (0.079 — 0.026 in.) diameter.

Fine less than ½ mm. (0.020 in.) diameter

and recombines them in proportions,

in which there are no medium grains, and in which coarse grains are found in a proportion double to that of fine grains, cement included.

If the grains of each successively smaller size are too large to enter the voids of the size larger than themselves, they will hold the larger pebbles apart, thus increasing instead of decreasing the total voids.[3] For this reason, the grading of sands and gravels should be done scientifically, and too many or too coarse intermediate grades are not desirable. The size of the largest pebbles used in the aggregate will determine both the number and size of grades to be separated. These will then be recombined in the proportions that will give the lowest voids. These proportions may be determined by experiment, or by determining the volume of voids in the coarsest grade and using the proper volume of the next finer grade to just fill these voids. It seems wholly probable that where the coarser material used becomes as large as gravel, at least three grades of coarseness become necessary to produce the minimum voids, or in other words, the maximum density.[4]

It but rarely happens that bank or bar sand or gravel runs constant in its proportion of coarse or fine throughout any considerable part of its mass, and it still more rarely happens that these proportions in nature are such as to give the minimum of voids. For this reason, it is desirable to install screening plants in localities where sands and gravels are used largely in concrete construction, especially in work where a high degree of strength is required; and as washing involves but small additional expense, both screening and washing of gravels are usually to be commended where there is a large consumption.

Shape of grain in concrete aggregate—Sharp sands have heretofore been almost universally demanded in specifications, but in many localities, sharp sands are not to be had except at great expense. Many tests have been made, which show that rounded grains give results wholly satisfactory. There is little doubt though that, with all other conditions equal, angular to sharp grains give a slightly stronger concrete.[1] It must be borne in mind, however, that round sand has from 2 per cent to 5 per cent less voids than the corresponding sharp sand,[2] and decrease in voids is to be desired.

——While sharpness of grain may exert a certain influence it is of so much less importance than the size of grain that the requirement of sharpness for sand should be omitted from concrete specifications.[3]

Angular fragments bond better than rounded, but on the other hand tend to bridge, leaving voids in the finished concrete.[4]

Smoothness of grain in concrete aggregate—It is perfectly manifest that the nature of the surface of individual grains or pebbles will have some bearing on the value of an aggregate. The cement will adhere more readily to a rough than to a smooth surface, and all other factors being equal, an aggregate the pebbles of which have roughened surfaces will produce the strongest concrete.[1] There seems to be little data available on the actual effect of smooth pebbles in concrete. Sabin[2] says in discussing crushed rock versus gravel for aggregate that

Gravel makes a good aggregate, although its surfaces are too smooth and rounding to give the best results.

Strength of pebbles in a concrete aggregate—In structures where little strength is required, the strength of the individual pebbles of the aggregate usually need not be considered. Where structures are subjected to severe tests, care should be taken to use gravels only, the pebbles of which are themselves strong.

Evidences that chemical decay is going on in the grains would indicate that the sand is of very inferior quality.[3]

In most well-worn creek sands and gravels, there is usually little need to examine for chemical decay. Granite and basic igneous pebbles are frequently so badly rotted as to be easily crushed in the hand. Thorough screening and washing, however, would probably remove much of the more seriously decayed material. It is believed that these gravels, though used locally for less important work, ought not be used where great strength of concrete is demanded.

Pebbles of shale or other soft material should be avoided in aggregates, as should also slate or other pebbles, in which there is a marked tendency to cleavage. For the same reason, and owing to its poor adhesive surfaces, mica is a harmful ingredient in sands, at least if present in quantities much in excess of 2 per cent.[1] It also increases the percentage of voids.

[The next article will discuss roofing gravel, paving, cushion and asphalt sands. —Editor.]

[1] Taylor, F. W., and Thompson, S. E., op. cit., p. 160.
[2] Op. cit., pp. 143-148.
[3] Op. cit., p. 189.
[4] Op. cit., p. 148.

[1] Sabin, L. C., Cement and concrete, 2d ed., pp. 171-2, 1907.
[2] Taylor, F. W., and Thompson, S. E., Concrete, plain and reinforced, 2d ed., p. 174, 1911.
[3] Taylor, F. W., and Thompson, S. E., op. cit., p. 154a.
[4] Sabin, L. C., op. cit., p. 204, 1907.
[1] Baker, I. O., A treatise on masonry construction, 8th ed., p. 103, 1895.
[2] Sabin, L. C., Cement and concrete, 2d ed., p. 200, 1907.
[3] Sabin, L. C., op. cit., p. 169, 1907.

Washed Gravel for Roads

IN THE Indiana Sand and Gravel Producers Association News Letter, the Indiana road proposition is discussed as to the use of washed gravel.

Indiana gravel roads have been built at a large expenditure of capital and this investment must be protected. The modern motor vehicle, with its high speed and pneumatic tires, tends to disintegrate these roads, whenever the traffic exceeds a certain limit, depending upon the character of the road and the location. The future demand for gravel roads will be for better construction; the day of the carelessly built, bank run gravel road is past.

Modern traffic problems must be solved in the following manner: First, the highways in each county must be systematized and the proper types and maintenance adapted to each part of the system; second, better construction of all types is necessary; third, preservation and maintenance of the present road system is of immediate importance.

A well-graded and clean gravel from 1½ in. to 2 in. down, including 30 per cent to 35 per cent sand and 8 per cent to 10 per cent very fine material for binder will make the most successful water bound gravel road. Plant washed and screened materials only can uniformly furnish this quality.

There is a growing demand for dustless roads. Bituminous binders offer a cheap solution of this problem. Indiana has had some experience in this kind of construction and maintenance. Some have been a failure, due principally to an excessive amount of clay, loam and other fine material mixed in the gravel. In other words, it is possible to successfully bind gravel roads with bitumens by penetration method or protect the surface by carpet coating of bitumen and torpedo sand, provided clean and well-graded materials are used. Only washed and screened gravel will answer this purpose.

In case a dirty gravel road containing excessive dirt is to be covered with a bituminous top there must be 1½ in. to 2 in. at least of clean sand and gravel added to the surface before the bitumen may be used with success.

The Indiana Sand and Gravel Producers Association is preparing specifications for these types for the use of engineers and road superintendents.

[1] Taylor, F. W., and Thompson, S. E., Concrete, plain and reinforced, 2d ed., p. 154c, 1911.

Sand and Gravel Plant Has Concrete Screening Tower and Buildings

The Carmichael Gravel Co. Has Erected Permanent Structures—A Very Complete Machine Shop and Power Plant

THE CARMICHAEL GRAVEL CO., of Williamsport, Ind., has a very complete and up-to-date plant. This company believes in the permanence of the sand and gravel business to the extent that they have used concrete in the construction of their screening tower, power plant and machine shop.

The gravel pit is situated directly across the Wabash river from Williamsport at a point where there is an unusually large deposit of coarse gravel, giving an abundance of material suitable for the larger commercial sizes. About sixty per cent of the plant's output goes through the crushers.

The accompanying views give a very good idea of the plant with its clean-cut concrete buildings. The sand and gravel is removed from a 40-ft. bank by a 2½-cu. yd. steam shovel and loaded into 20-cu. yd. bottom-dump cars.

Grizzlies on Cars

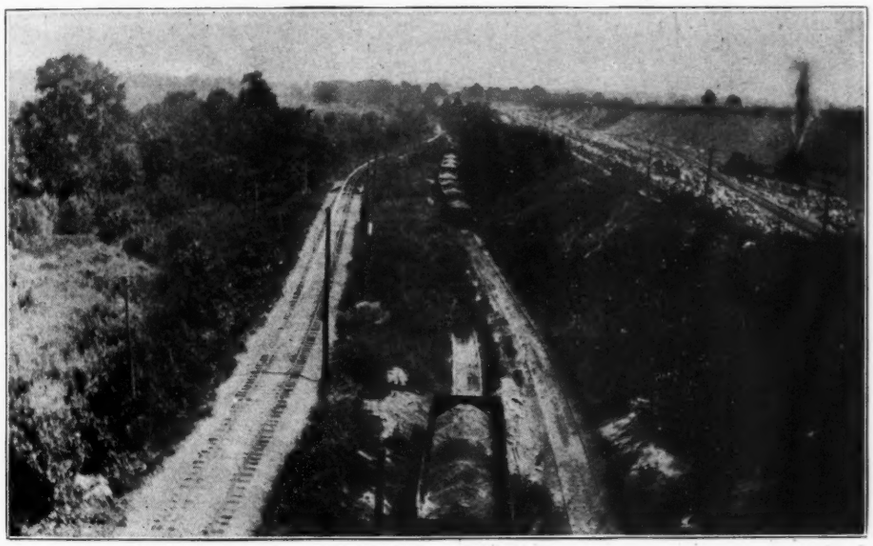
The cars are covered with light I-bars placed 8 in. center to center. These act as an initial grizzly. The big steam shovel pours the gravel on top of this grating—all the fine material passes through the I-bar screen and into the car.

The oversize is rolled off of the cars along the side of the track, as can be seen in the cut, thus safeguarding against overloading the crusher, and being handy for reloading at some future time.

At present the plant has two crushers, a No. 5 gyratory crusher and a 36-in. Symons disc crusher, but will eventually have a third and larger one that will handle all this material.

The gravel is dumped into a hopper at the foot of the conveyor belt, which is so arranged that material less than 2½ in. passes on through to the conveyor, the oversize being directly chuted to the large crusher.

The grizzly of the dumping hopper is inclined at about 30 degrees. The oversize material slides down and is directed into a gyratory crusher immediately above the belt. (One of the views shows the hopper just after a car load of gravel has been dumped and the large stones are being fed down to the crusher.) This arrangement is such that the belt is protected from being cut by the sharp stones from the crusher. The crushed stone is deposited on top of the gravel on the conveyor and does not touch the conveyor belt.



Large loaded car storage

Two-Stage Conveyor

The rise to the screens, which is about 90 ft., is made in two lifts, or by two 30-in. conveyors, as can be seen in the view of the plant. At the half-way point the first conveyor ends in a chute which sends the gravel to the second conveyor and on to the top.

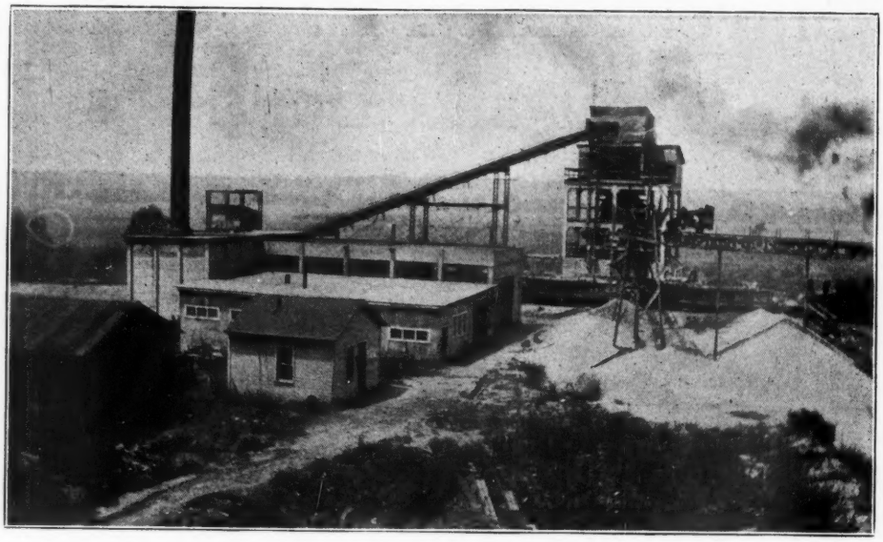
Unusual Screen Arrangement

The arrangement of the screens is different from most plants. It is compact and sufficiently large to give plenty of screening area. At the initial screen the oversize is chuted to the second crusher from which it is again returned to the loading hopper and up the conveyor.

The re-crusher is mounted side by side of the initial crusher on a concrete foundation and both are driven from one shaft and by one motor.

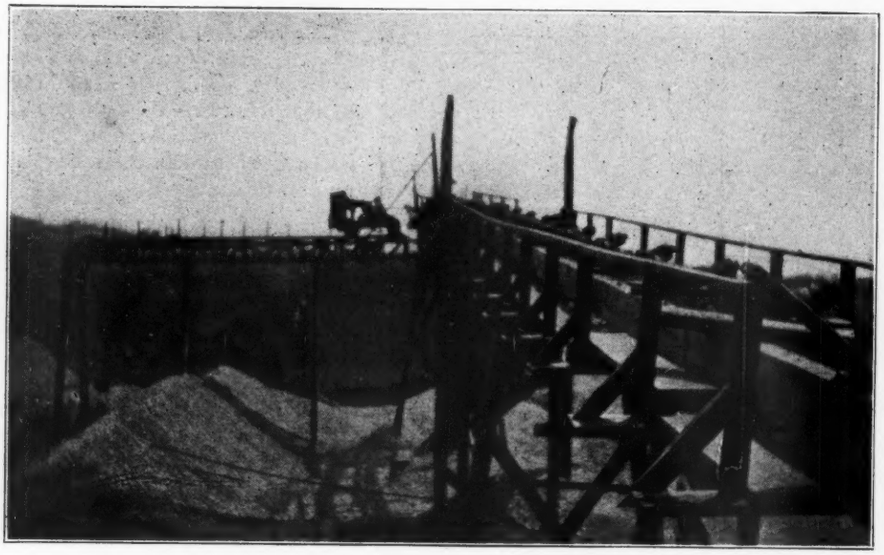
The screens, which are of the Gilbert type, are mounted in batteries of twos so that half the gravel goes through each.

Excavating gravel—I-bars on top of car to reject stone over 8 in.



View of plant as a whole

Screening tower showing how mat ed. Co

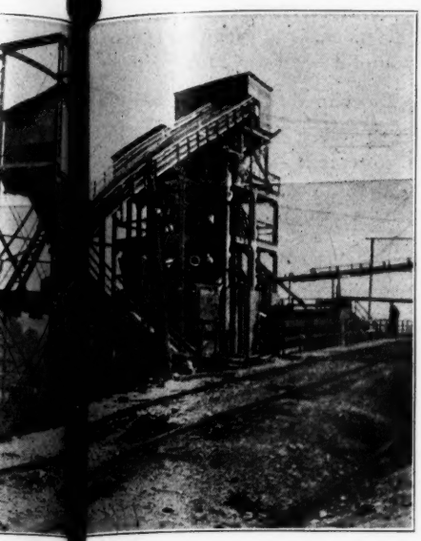


Movable tripper enables the area of the storage pile to be increased

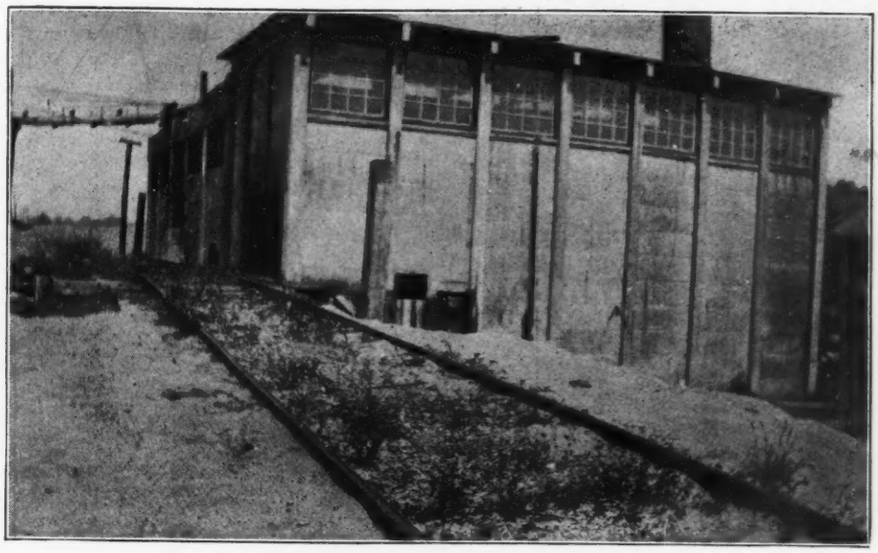
Machine s concrete

Gravel is carried to storage pile by a belt conveyor

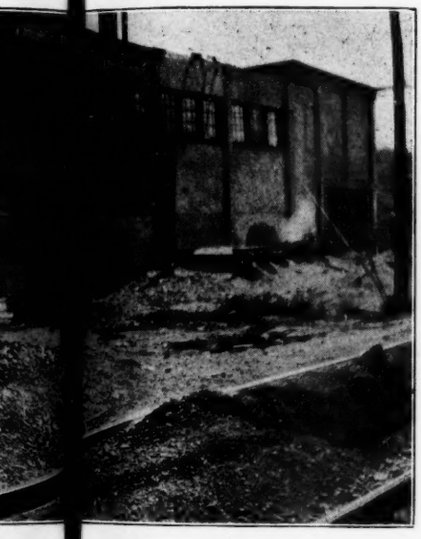
Interior of machine shop rangemen



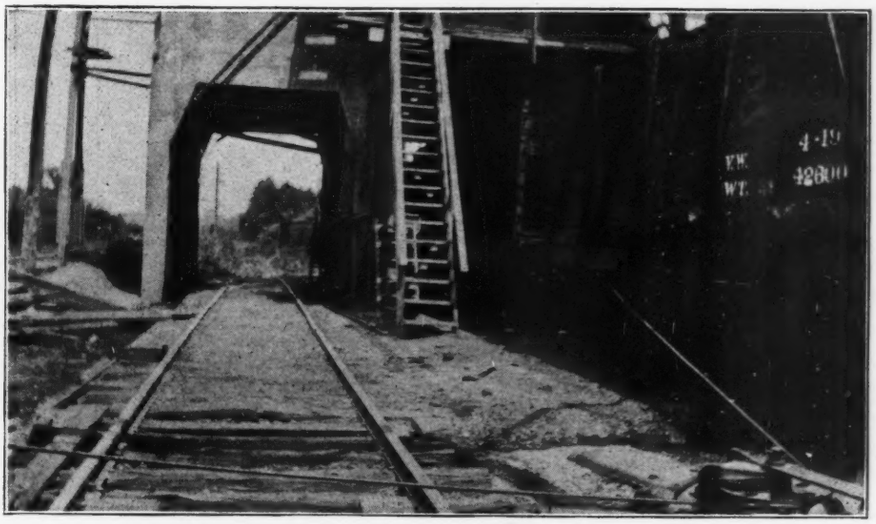
how mat ted. Concrete and steel structure



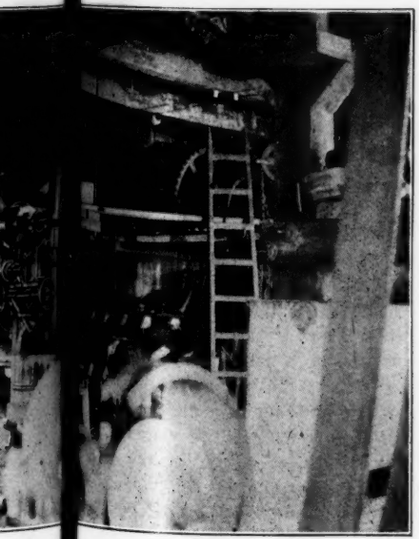
Power house constructed of concrete



Machine s concrete

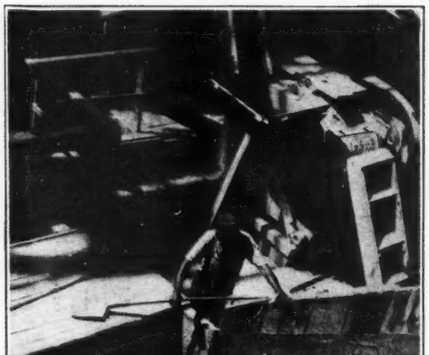


Loading tracks showing steam hoist car mover connected to car



ine shop rangement of machinery

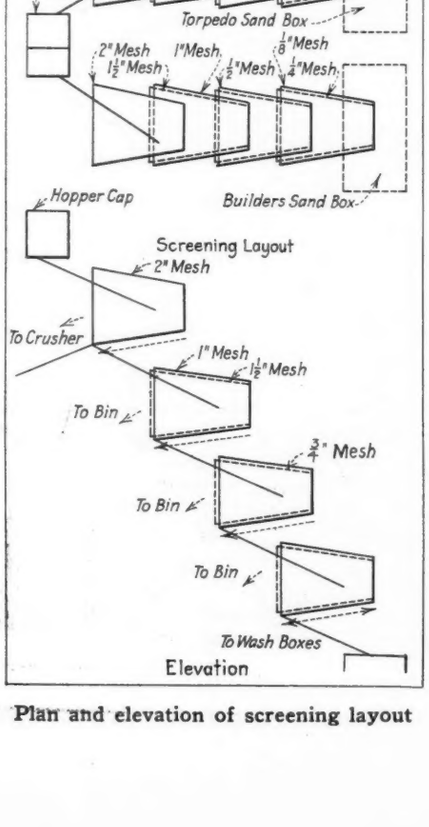
Interior of engine room showing engine which is now replaced by motor drive



Just after a carload has been emptied at unloading hopper

This arrangement gives large screening area and reduced head room. The gravel is screened and washed into all sizes from 2 in. on down to builder's sand.

The accompanying sketch shows the layout of the screens. The gravel is deposited in the hopper at the top where it is divided, half going into each battery. As can be seen by the variation in the mesh of the screens, quite a number of different materials can be obtained. Owing to the large screen area, the speed of the screens is considerably above the average.



Plan and elevation of screening layout

A very recent addition to the plant has been new sand boxes which are of the flight-conveyor type. The sand and water flows into large rectangular steel tanks in which the sand deposits; the water flowing on off. A flight conveyor passes through the box and after the box becomes partly full the clean sand is scraped up and out into the sand bin. It has been found here that this type of sand box gives very satisfactory results.

Complete Power Plant and Shop

Some of the interesting parts of the plant are the power house, the machine shop and the gravel storage arrangement. Power is supplied by a 310 h. p. stoker-fed boiler. A water-tube boiler and stoker are seldom found in gravel plants. The coal, which is a finely ground steaming coal, is stored above the boiler and delivered to the stoker by a chute.

One fireman in the boiler room can tend fires and watch the feed-water pumps. A soda ash water softener is used to react against the lime of the feed water. Further economy is obtained by utilizing exhaust steam in a jet feed-water heater.

The prime mover is a 250 h. p. Corliss engine which runs at 120 r. p. m. A 150-k. w. alternating current dynamo is belt driven to furnish power to the motors about the plant. A small direct current motor is shaft driven to excite the fields of the big generator.

The dynamo furnishes current to four motors; two 30 h. p. motors on the conveyor belts, one 20 h. p. motor on the screens and one 75 h. p. motor to run the two crushers. Water is pumped from deep wells in two stages by direct-connected steam-turbine driven pumps, one of which is deep down in the well and acts as a booster pump for the second, which elevates the water to the top of the screening tower. The turbines run at 2,400 r. p. m. and pump 1,100 g. p. m. each, under a head of 120 ft.

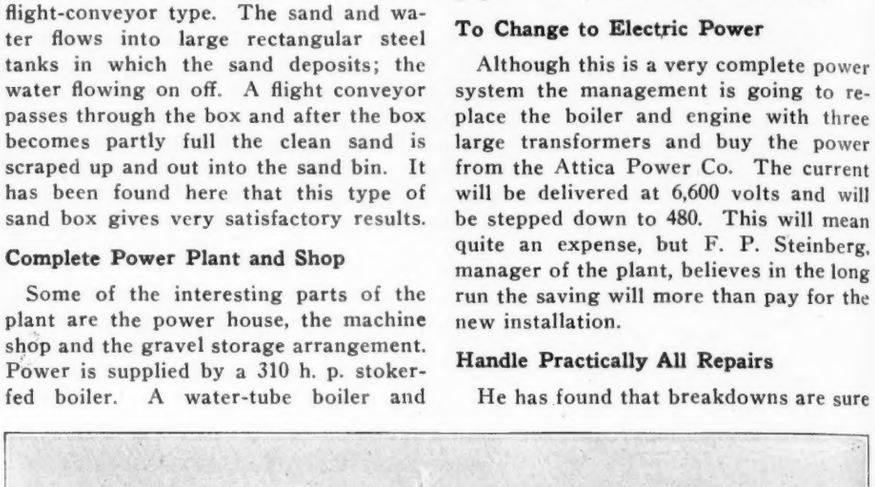
To Change to Electric Power

Although this is a very complete power system the management is going to replace the boiler and engine with three large transformers and buy the power from the Attica Power Co. The current will be delivered at 6,600 volts and will be stepped down to 480. This will mean quite an expense, but F. P. Steinberg, manager of the plant, believes in the long run the saving will more than pay for the new installation.

Handle Practically All Repairs

He has found that breakdowns are sure to come sooner or later, and when a plant can handle its own repairs, it means that time and money will be saved. To this end the Carmichael plant has installed a very complete and useful machine shop. Its power is furnished by a 10 h. p. gas engine, which will be replaced by a motor when the electrification of the plant is accomplished. This is connected to a shaft which in turn operates a 6-ft. three-speed machine lathe, a saw, a drill press and a carborundum grinder. A blacksmith forge and anvil and an oxyacetlyne welding outfit enables the cutting and welding of all ordinary sized pieces of equipment.

Last winter the steam shovel was overhauled; a new piston was put in one cylinder, the piston rods were turned down, new stuffing boxes made and the guides were trued up and the boiler was overhauled. This was all done in the machine shop and under the direction of the plant superintendent. It is often necessary to turn up bolts or pins, or recut threads. Spare parts are kept on hand and a machinist is kept busy in



The large material is rolled off the cars where it may be easily loaded later

eliminating small breakdowns as soon as they occur. This is an unusually complete machine shop for any gravel plant.

Storage Facilities

Just in front of the machine and power houses is a storage pile of gravel which by fall amounts to about 75 carloads. This company makes it a practice to store 1-in. stone and smaller for winter and early spring use. A belt conveyor with a movable tripper has been installed to deliver and spread the gravel at the storage pile. In the first view can be seen the long belt which runs from the screens to the storage pile and also part of the cross, or distributor, belt. When the demand for gravel is less than the plant's capacity, this conveyor can be operated and the gravel stored. The second view, which is taken from on top of the conveyor, shows the tripper. In the spring when a load of gravel is wanted before it is warm enough to operate the plant, it is taken from the storage by a slip scraper, which empties it upon a slide to the cars. It is so arranged that the storage pile is on ground high above the loading track so that a slip scraper can be used very economically—that is, the gravel does not have to be elevated to the cars but is scraped down to a slide to the cars.

This company is planning the installment of quite a large permanent storage bin which will permit a much larger quantity of gravel to be stored in such manner that it can be loaded into the cars without labor. It is believed that in so doing, the company will be able to supply its best customers with gravel early in the season before it is possible to operate. In spite of the fact that the present rehandling of the material greatly reduces the profit, it is believed that storage is profitable because it lines up customers for the operating season.

New Crusher Installation Planned

Since such a large part of the gravel is crushed, it is planned later to increase the plant capacity by the installation of a separate screening and washing process to handle crushed rock products. The gravel is largely composed of trap, limestone and granite with but little sandstone.

As far as possible, all material is loaded directly into cars, three loading tracks being available. A normal day's output is 40 cars when traffic conditions will permit.

Very recent information advises that the electrification is already complete, and that the plant now buys its power from the Attica Power Co. The two turbine-driven pumps have been replaced by two direct-connected, motor-driven pumps, each of 1,800 g. p. m. capacity.

W. P. Carmichael of St. Louis, is principal owner and president of the company and F. P. Steinberg is manager.

Avoid Verbal Contracts [Orders]

Numerous Decisions Have Given Buyer Loophole to Escape Delivery

A LARGE NUMBER of important business transactions occur each day in which the oral contract is relied upon as being entirely sufficient. Oral contracts are usually considered binding where the transaction concerns promises to sell or deliver goods, and the buyer agrees to accept and pay for them. Under this form of contract the seller is the party who suffers in most instances, for he has nothing more than the buyer's mere verbal promise to fulfill certain obligations.

Don't Wait to Test Law Yourself

The reason why so many sellers still place their confidence in oral contracts is probably because they have not been forced to test the validity of these contracts, or required to produce sufficient evidence that a contract was actually entered into. When the buyer states that he did not enter into a contract for the purchase of goods, and the seller has no written evidence to substantiate his claim, then he will realize how difficult a matter it is to present sufficient evidence in court in proof of his claim. Even where the seller can prove that the buyer entered into an oral contract, the buyer still has many chances of escaping liability.

The importance of putting contracts into writing can not be emphasized too much, whether they fall within the terms of the statute of frauds or not, for a written contract is absolute proof of the promises made by both parties, while the validity of an unwritten contract is in many cases not established except after costly litigation.

The fallacy of relying upon an oral contract was demonstrated quite forcibly to the seller in the following instance:

Examples of Court Decisions

In this case, Hammond, the seller, entered into an oral contract with Blickford, the buyer, to deliver a carload of material at Blickford's warehouse. Hammond performed his part of the contract faithfully and shipped the material as agreed upon. When the car arrived at its destination the railroad company promptly notified Blickford of its arrival. Blickford refused to receive or accept the material because he discovered later on that he could purchase similar material at a lower price. The carrier, after holding the car for some time, finally transferred the material to its terminal warehouses.

Hammond brought suit to recover the value of the material and to enforce Blickford to perform his part of the contract. Hammond was not allowed to recover.

The court said: "While the proof shows that the defendant in this case verbally agreed to purchase the material, upon certain terms and conditions disclosed by the record, there is no evidence whatever from which a jury would be warranted to find an actual acceptance and a receipt of the material sold by the verbal contract, as would gratify the plain provisions of the statute, and would constitute a valid and enforceable contract of sale."

In order to illustrate what the court meant by "actual acceptance and receipt of the material" we give below that part of the statute of frauds relating to this class of contracts. This statute has been enacted, in some form, in nearly all states, and in most instances contain similar provisions.

"A contract to sell or a sale of any goods or choses in action of the value of fifty dollars or upward shall not be enforceable by action, unless the buyer shall accept part of the goods or choses in action so contracted to be sold, or sold and actually receive the same, or give something in earnest to bind the contract, or in part payment, or unless some note or memorandum in writing of the contract or sale be signed by the party to be charged or his agent in that behalf.

"There is an acceptance of the goods within the meaning of this section when the buyer, either before or after delivery of the goods, expresses by words or conduct his assent to becoming the owner of those specific goods."

In another case in which an oral contract was involved, and in which the buyer was not bound because he did not accept the goods, the court said: "The statute does not speak of delivery, but super-adds to the delivery which the common law requires acceptance of the goods, or some part of them by the purchaser. It confers upon the buyer alone the privilege to prevent a consummation of the contract by refusing to accept and receive the goods. While there can be no acceptance under the statute without delivery by the seller, yet there must be both delivery and acceptance in order to sustain an action upon the contract. In order to satisfy the statute there must be a delivery of the goods with intent to vest the right of possession in the vendee, and there must be an actual acceptance by the latter with intent to take possession."

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Fundamental Principles of Safeguarding

What to Provide With Guards and How to Do It

By Sidney J. Williams
Secretary and Chief Engineer, the National Safety Council, Chicago, Ill.

THE FIRST HALF of our subject is —what shall I guard? The second half is—how shall I guard it?

If you want your plant to be 100 per cent safe, the answer to the first question is—guard every moving part, wherever located, on which a workman might be injured if he came in contact with it in any way or from any cause whatsoever. If the moving part is in a place "where nobody ever goes," remember that some one is likely to go there sooner or later, in connection with the repair or maintenance or alteration of the machinery itself or of the building, or for some other reason which you cannot anticipate. You probably have heard the classic story—a perfectly true story—of the man whose heel was cut off by an unguarded gear 14 inches below the ceiling. The man was standing on a scaffold, working on another shaft nearby; to brace himself he placed his foot against the shaft on which the unguarded gear was located, his foot slipped, and was caught in the gear. Many similar examples could be quoted of accidents occurring in out-of-the-way places. Recognize this fact.

Overhead Shafting and Belts

You may be puzzled by attempting to apply this principle to the guarding of overhead shafting and belts. Many shafts contain miles of overhead shafting which it is almost a physical impossibility to guard. On the other hand, oilers and repairmen are frequently injured, sometimes fatally, on unguarded overhead shafting or belts. The only solution is, if the shafting positively cannot be guarded, to prohibit absolutely any work on such overhead transmission while it is in motion. Repair work, shortening of belts, etc., can be done during the noon hour or at night; oiling likewise—or, better still, install automatic oilers or oilers which can be filled from the floor by using a special oil can with long spout. For details, see the National Safety Council's "Safe Practices" pamphlet on this subject.

A gear or belt or other dangerous moving part which happens to be located below a table, or in some other place where it is partially hidden, is not thereby safe. Someone occasionally must reach under the table to sweep or repair the floor or oil or repair the machine. Someone may slip or stumble so that his arm comes in contact with a gear or belt which would be safe for the workman standing in his normal position. The immigrant, totally ignorant of machinery—and it is hard for us to realize the completeness of the ignorance on this subject, on the part of foreigners brought up in farming districts—may deliberately put his hand or his finger into an opening that looks interesting, just to see what it is. If he finds that "it" is an unguarded gear, it is easy to say that the accident is his own fault—but that does not relieve our obligation to pay his compensation, nor does it restore him to his vacant place in the gang.

What I have said of gears and belts applies equally well to any moving part on which a man might be injured—counterweights, cranks, reciprocating parts; also, of course, to the operating point of machines.

How to Guard Machinery

The second half of the problem is—as already stated—"How shall I guard it?" Here are a few points to remember:

1—A safeguard should be so designed and constructed that it will prevent all accidents on the part guarded—not only accidents to the operator while at his regular work, but also to the operator or passers-by in case they slip or fall or carelessly touch the machine.

2—The guard should not interfere with production. If it does, it is liable to be taken off. In designing a guard it is generally wise to consult the man who will use it.

3—In general, the guard should be attached to the machine and not to the floor; if attached to the floor, use a connection which will interfere as little as possible.

4—The guarded part must be easily accessible for oiling, inspection, and repair. The door or removable section provided for this purpose should be hinged or otherwise attached to the remainder of the guard, or to the machine. If not, it is likely to be left off permanently.

5—The guard should not interfere with cleaning and sweeping around the machine. It should, therefore, be kept generally about six inches above the floor.

6—The guard should be strong enough to resist injury and keep its shape. A light, flimsy guard soon becomes bent and is discarded. A substantial guard is cheaper in the end.

7—Incombustible guards are preferred. Wooden guards, soaked with oil, may become a serious fire hazard. Metal guards are neater and wear much better. "Metal guards look as if you wanted to; wooden guards look as if you had to." Guards may be made of cast iron, sheet metal, wire mesh, expanded or perforated metal, or slate. Where subjected to acid or fumes, wooden guards may be necessary.

8—It is desirable to interlock the guard with the operating mechanism where possible, so the machine cannot be operated unless the guard is in place.

9—A safeguard can often be so designed that it will also serve to prevent wear on the parts guarded—for example, a solid gear enclosure.

Let us consider the application of these suggestions to the design of gear guards. Cast-iron guards are preferred because they may be made to fit more snugly, present a better appearance, and protect the gears from dust and injury. In shops having similar gears on several machines, the cost of patterns and cast-iron guards will be no greater than the cost of "built-up" guards. A cast guard of one machine may be used as a pattern for making guards for similar machines.

Guards for a variety of machines, and in many sizes, may be more cheaply made of sheet metal. In large guards, an angle iron is used to make the joint between the flat sides and the curved part of the guard. In smaller guards this joint may be made by cutting projections (like saw teeth) on each side piece and bending that over to form a smooth curve. The joint may then be made either by spot welding or by riveting. Short pieces of angle iron may also be used to form the joint—about ¾x¾x⅛-in. angles, 1 in. long, 3 or 4 in. apart.

Gears should be completely encased; or where this is impracticable, should have a band guard with side flanges extending inward beyond the root of the teeth. If there is a spoke hazard, the gear should be completely enclosed, or filled in between the spokes.

Bolts, flywheels, shafting, and large gears are often guarded by an open-work, rather than a solid enclosure. Such guards should be so designed that no one can get his hand or his finger into the danger point even if he tries. If the guard comes within four inches of any danger point the opening should not be greater than one-half inch square, which

*Presented at The A. B. C. Session, Eighth Annual Safety Congress, Cleveland, Oct. 2, 1919.

is small enough to exclude fingers. If more than four inches away—which is about the maximum length of a man's finger—the openings may be larger than one-half inch, but not larger than two inches square, this being small enough to keep out a man's hand. If a slatted construction is used the slats should not be more than one inch apart.

The greatest difficulty is in guarding machines on which men are working. Let me repeat that it is very important not to attempt to guard machines in a way which will interfere with production. The great majority of both foremen and workmen will seriously object to such a guard, will use it under protest and when the opportunity arises they will take it off and not put it back.

Safety engineering does not consist in simply building wire mesh guards, nor in buying safety devices which look pretty in a catalog, and putting them on the machine without regard to the wishes, the convenience, or the efficiency of the operator. The real safety engineer will, where necessary, study the operation of a machine until he understands it as well or better than the operator himself—as well as the foreman, the superintendent, the master mechanic; and then he will apply their brains and his own in working out either a guard, or a change in the machine, or a change in the operation, which will remove the underlying hazard and make the operation intrinsically safe.

Prospects of the Indiana Sand and Gravel Industry

ACCORDING to the report of the U. S. Geological Survey for 1916, the production of sand and gravel in Indiana for that year was 8 million tons. It appears that the output will have to be doubled in order to meet the demands for 1920, in the event that our highway laws are sustained. Under these circumstances, no doubt, every producer in the state will want to increase the capacity of his plant before next season.

The advanced methods employed in road building and the possibility of State and Federal inspection will probably mean that specifications will be more rigid and more strictly adhered to. In planning for increased facilities, therefore, it is recommended that consideration be given to the anticipated requirements for more uniform grading and accurate separation of coarse and fine aggregates. In this connection we would like to suggest that an abundant supply of water is one of the foremost requisites for turning out good material.

The service of our Engineering Department is at your disposal in helping to devise specifications.

—Indiana Sand and Gravel Producers' News Letter.

Cut Your Own Costs!

WE FREQUENTLY HEAR some one referred to as being a "price cutter" because he has quoted a lower price than the party complaining. It is a well established economic principle that indiscriminate price cutting is not in the public interest, and it is safe to assume that no sane business man will sell his product at a price lower than he can afford without having what he considers a good reason for doing so. Therefore, before condemning him we should not only endeavor to ascertain his reasons, but should examine carefully into our own costs. Experience has taught that a free interchange of accurate and reliable cost information is highly beneficial. In fact, it is considered by many the most important function of Trade Associations.—Ben Stone, Business Manager, Illinois Sand and Gravel Producers' Association.

The Freight Car Situation

IT is reported that although the freight car situation is still bad, that there is considerable relief. Owing to the large amount of coal being moved in Illinois there is still a shortage of open top cars for sand, gravel and stone, but this is not as pronounced as a short time ago.

The situation in the west seems to be worse than the central west. W. V. Lowe, general manager of the Sioux Falls Granite Co., Sioux Falls, So. Dak., reports that although there is a surplus of cars of certain types, the number of open top cars is far too short.

Return Load Bureaus to Aid Inter-City Truck Haulage

THE NECESSITY of establishing Return Load Bureaus in the different cities to aid in the development of intercity truck haulage is explained by M. L. Pulcher, General Manager of the Federal Motor Truck Co. of Detroit, Mich.

These bureaus are established for the purpose of distributing the freight so that the truckman is assured of a return haul when he brings a load from one city to another. The Chambers of Commerce in many cities have given valuable assistance in this line in many instances, even going so far as to establish bureaus under their control in an effort to relieve freight congestion in certain sections and cities. The work, however, entails concentrated and aggressive effort, and the services of a salaried representative with permanent headquarters are absolutely necessary, so that it is usually found more satisfactory to establish these bureaus under the direction of the truck men themselves.

Both shipper and operator find it to their advantage to finance such a clearing house themselves. This is easily arranged by charging commissions on all shipments arranged by the bureau. Truck operators should arrange a rate midway between the tariff charged by railroads and the express companies. The return load is very important.

University of Michigan to Add Highway Engineering Course

THE BOARD OF REGENTS of the University of Michigan, by its action on August 6, 1919, in establishing a Chair of Highway Engineering in the Department of Civil Engineering and also its authorization of the appointment of an assistant professor and assistants in highway engineering, has made provision for a broad development of highway engineering and highway transport undergraduate and graduate instruction, and for the investigation of the many problems which have developed on account of the rapid changes in conditions in recent years.

Thoroughly trained and experienced highway engineers are needed to occupy the innumerable positions connected with the administration, financing, design, construction and maintenance of the 2,500,000 miles of rural highways and the thousands of miles of streets in the municipalities of the United States in order that the highways of our country may efficiently serve the agricultural, industrial, commercial, social and military requirements of the nation.

Highway officials, progressive educators and many prominent business men realize that a serious condition will confront the United States if graduates of our technical schools are not properly trained in highway engineering.

The phenomenal development of highway transportation in the United States has created a demand for men having knowledge of and trained in a new technical field, which may be designated Highway Transport Engineering. Fundamentally, this branch of engineering deals with the science, art, economics and business of highway transportation of passengers and commodities.

The University of Michigan will offer unlimited facilities for instruction and research work in Highway Engineering and Highway Transport.

Professor Arthur H. Blanchard will have charge of the highway department of the school of civil engineering. Details of the course may be obtained by communicating with the registrar.

Potash Industry of the United States and Its Future Possibilities

Cement Plants Are Losing Much Potash at Present—Discussion of How This Loss Could Be Reduced and How Production Could Be Increased

WASHINGTON, D. C.—A preliminary report, covering the potash industry of the United States and its possibilities for future production, has just been prepared by Arthur E. Wells of the Bureau of Mines, and has been published by the Department of the Interior.

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"With the Cottrell precipitation apparatus, a commercial recovery of 90 per cent of the potash being lost at certain plants has been obtained. At other plants the recovery has not been so high—being nearer 70 per cent. The available data indicates that wet cleaning devices which have been installed at several plants may be relied on to give 75 per cent recovery of the total potash. Where wet systems of cleaning are used in connection with Cottrell precipitators, a recovery of 85 to 90 per cent can readily be obtained. Assuming an 80 per cent recovery, the total recoverable potash from all the plants of the country, therefore, is about 70,000 tons per year.

Usually about 90 per cent can be recovered by digestion with hot water for a period of several hours, or under pressure for a shorter period, so that the total available recoverable potash would be between 60,000 and 65,000 tons per year.

Capacity of Present Installations

"There are now 14 cement plants in the United States at which apparatus has been, or is being, installed for the recovery of potash from the waste gases from the kilns.

"The total capacity of the 14 plants is about 43,000 barrels of cement daily, and when running to capacity the amount of potash that is volatilized daily is about 100,000 pounds. The recovery apparatus is expected to give an average recovery of about 80 per cent of the volatilized potash, so that with 100 per cent capacity operation the total yearly capacity might be 15,000 to 16,000 tons. However, the plants are not running to capacity and what is now being recovered is being disposed of only with considerable difficulty. In fact, there has been very little consistent effort to enter this field by the cement companies because of various adverse factors during the last several years. The present production is less than 5,000 tons per year, but it is believed that with an assured price of $2 per unit the production would probably be about 8,000 tons per year from present plants.

Present Loss of Potash

"Many of the plants in the United States do not have sufficient potash in the raw mix to make its recovery profitable, and others, for various reasons, would not find it advisable to install recovery plants. At about half of the plants in this country, representing about 45 per cent of the total manufacturing capacity, the loss of potash by volatilization under present practice is greater than two pounds per barrel of cement. Assuming that only these plants which are losing at the present time 2.0 pounds or more (averaging 2.7 pounds) potash per barrel of cement, should put in recovery plants, the amount of potash which might be recovered without any change in charges or operation would be between 45,000 and 50,000 tons total potash per year, or about 40,000 tons available potash.

Cost of Production

"By the Cottrell Process, this amount could be recovered in a dry product carrying from 7 to 12 per cent total, or 6 to 11 per cent available potash. The actual cost of recovering this material by the Cottrell treaters, at an average plant having a capacity of 3,000 barrels of cement per day, would be about 60 cents per unit K_2O, of which cost 35 cents would cover actual operation, and 25 cents would cover depreciation and interest on plant.

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"The dry dust, or sludge, contains such a small percentage of available water soluble potash that it can be sold only locally. Thus, to market any considerable amount in competition with higher grade salts, the potash must be leached out and converted into a high-grade water soluble salt.

"The cost of producing a higher grade product by leaching and filtering the recovered dust or sludge produced in either process, and crystallizing out the potash as sulphate or chloride is estimated to be about 60 cents per unit in addition to the cost of recovering the dust or sludge. Thus, 40,000 tons of potash can probably be recovered in a salt running 40 to 50 per cent K_2O, at a cost of about $1.20 per unit to $1.30 per unit of potash (K_2O). With royalties, selling costs, storage charges added, the total cost of the high-grade product would be nearly $1.80 per unit. Various economies are possible, such, for example, as the erection and operation of a central leaching plant for a group of plants.

"A two-year period of high prices would not be sufficient to induce cement companies to install recovery devices or to go into the production of potash, for it would require from six months to a year to make the installations, and there would be only a comparatively short period of high prices to allow amortization of investment. Due to the general conservation of the cement industry it is believed that a five-year period of an assured price is necessary to bring about any great production, even for the above quoted 40,000 tons of potash."

Influence of World War on Phosphate Rock Industry*

Development of Ground Phosphate Rock Industry — Present Conditions and How They Can Be Maintained in the Future—Tennessee Phosphate Fields Will Last Fifty Years

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War Reduced Demand

The sudden stopping of this sending abroad of two-thirds of this valuable product, while beneficial in the altruistic view of conservation of this material for our own use, played havoc, as may be imagined, with the immediate activities in the phosphate-producing districts.

Upon the Ossa of this oversupply of the demands of the existing manufacture of acid phosphate in this country was piled the Pelion of a savage curtailment of even this demand by the enormous prices received by sulphuric-acid manufacturers from makers of munitions. Without sulphuric acid it was impossible to manufacture acid phosphate, in the production of which 90 per cent of the phosphate rock was used.

The result was that the poor miner of phosphate rock became a "prophet without honor indeed." The industry languished and prices dropped to the low point of $3 per ton for the best 75 per cent rock.

Under these conditions the low-priced labor that so far had made it possible to yield the returns necessary to keep going at the meagre prices which the fertilizer interests had thus far forced the miners to accept, gradually drifted away to the more attractive munition centers of the South, to the industrially active fields of all kinds throughout the North, and by no means least to the higher wages of agriculture which war prices have forced the farmers to pay.

Low Grade Waste Product

When even the "Granary of the United States," the corn belt of Illinois, whose deep alluvial soil had always been counted as inexhaustible, began to grow thin in spots, that apostle of the "Illinois idea," Dr. Cyril G. Hopkins, hailed as a savior the then easily obtainable low-grade waste product of the Tennessee phosphate mines. This material had thus far been thrown away to enable the miner to produce the high-grade rock required for the production of acid phosphate, in which the content of phosphorus was cut in half by adding the sulphuric acid to render it available.

Starting with the use of this waste material, which could, of course, be dried and ground at a reasonable profit with a selling price of $3 per ton or less, according to quantity of production, it took many years of effort to finally show the Illinois farmer that he could afford to pay even more than $9 or $10 per net ton, which this material is now bringing at the mines.

Turn to Produce Ground Rock

The few producers who had thus realized the true possibilities, undaunted by the difficulty of making sales to fertilizer manufacturers, turned their entire product as far as possible into ground rock for direct use by the farmers, managed to keep up a precarious existence even deprived of the old mainstay of the acid-phosphate manufacturers, and were rewarded by a gradual rise in prices to at least make up for increased cost of labor and supplies.

In the meantime the war stopped, and with it the extraordinary demand for sulphuric acid by munition makers. Fertilizer manufacturers sought phosphate rock to utilize in making acid phosphate, not only because the immediate demand was stimulated by the certainty of $2.26 wheat and the high prices of all other crops, but because acid phosphate forms the only practically unlimited storage possibility for sulphuric acid from the otherwise running-over chambers.

Almost in the face of this demand came the practical cutting off of supplies from Florida by a strike of the meagre number of laborers left in that field. Even the ostensible settlement of the strike by granting the demands of the laborers has failed to re-establish production there on the gigantic scale warranted by the demand, largely for the reason that the old cheap labor appears to have meantime drifted permanently into other more lucrative fields.

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and by apparent oversupply gradually cut down the selling price of rock again.

This may again be the result. But if producers who are not primarily fertilizer manufacturers will cater to and supply consistent and steadily the demand for raw ground rock for direct application, the waste will be avoided, the dependable steady tonnage will be maintained and the phosphate business of Tennessee will stay on a steady upgrade of prosperity to that inevitable time so surely approaching when its deposits will in the natural course of things be exhausted. But by the time exhaustion comes, satisfactory earnings will have caused miners and owners of phosphate rock to realize some of the real profits they should enjoy, instead of the ruinous gaps of loss eating up the spasmodic fits of profit as has been the case for 20 years or more.

Producers Association Needed

A real Tennessee Phosphate Producers' Association, organized and operated to regulate the business of the producers, for the producers and by the producers, will be the only lasting solution of the problem.

Following close upon this will come, with the cheap power of Muscle Shoals available, the electrochemical production of phosphorous, phosphoric acid and all their compounds direct from the rock at the point of production, so that as the high-grade rock becomes scarce with advancing time, the new processes will give new value to the low-grade deposits and will minimize the disadvantages of the deposits now too distant from transportation to be worked.

Carefully conserved and thus operated, the life of the Tennessee field at good prices and high rate of production can be extended over 50 years, whereas with the ruinous waste arising from the old method of culling out the high grade and throwing away the low, 10 years of real production will bring about a complete exhaustion.

Even the heretofore short-sighted fertilizer manufacturers may come in time to see the error of their way and help instead of damage, as in the past.

Preparation of Fuller's Earth

THE FOLLOWING PRINCIPLES in the preparation of fuller's earth has been compiled by W. C. Phalen, in a monthly report on Mineral Investigation of the United States Bureau of Mines.

As is well known the main use of fuller's earth is for the bleaching of oils and the gravity method is used in preference to agitation. The main object sought is to get the lightest possible color with the most prolonged use of the earth, the renewal of which is accomplished by burning.

The preparation of the earth prior to its going to the filtration plant is of great importance. It follows that the workman, firing a burner for fuller's earth, is the party who breaks or makes the life of the earth in the filter. The preparation is done by burning and the first burning is the most important of all.

All fuller's earth is hygroscopic; that is, it absorbs moisture from the air. During the first burning it is essential to get rid of this absorbed moisture and also the chemically combined water. The quantity of water varies from 10 to 15 per cent, and this must be expelled before the earth goes to the filter. Organic and volatile salts are also expelled during the first burning, and calcium carbonate is converted to caustic lime.

It has been found by experiment that the best temperature for the initial burn is 600 to 700 degrees F. At this temperature all moisture is expelled and there is no danger of fusion or incipient fusion, whereby the particles are glazed, the pores closed and the absorptive power lost.

The second burning is almost as important as the first, as there is a greater tendency for the grains to fuse and stick together, than in any subsequent burnings. It is, therefore, run more slowly than the first or subsequent burnings, and at a temperature of 1050 to 1100 degrees F. In subsequent burns with Florida earth, the proper temperature has been found to vary from 1100 to 1200 degrees F. Any temperature above 1200 degrees caused a loss of filtering power. It was found on the fourth burning of two samples of earth from the same filter that of two samples, the one burned at 1100 degrees F. and the other at 1400 degrees F., the overburn of 300 degrees F. caused a loss of filtering power of 30 per cent.

Buying Checked but Not Suspended

BUYING has been checked but not suspended by the iron and steel strike. Bookings are chiefly with the furnaces and mills not seriously affected.

The continued favorable progress of the strike is all that the producers expected. Where protection is sufficient to prevent intimidation, workers are returning. Much encouragement is taken from the refusal of the Bethlehem employees to go out, and from the conditions in the pivotal Monongahela Valley. The continued absence of marked rioting points to a drawn-out issue.

Producers remain firm in their determination to shut down mills if it is not safe to run them, and consumers are expressing an unqualified support. It remains that without relief in 30 days the automobile industry will begin to feel the pinch.

Prompt blast furnace coke is lower, due to an accumulation at ovens, according to a bulletin by The Iron Age.

West Coast Business Active

IN SPITE of the fact that construction work in this section of the country has been impeded not a little by labor conditions, the feeling of uncertainty is gradually being dispelled. The "Own Your Own Home" movement and the needs of expanding business are potent factors in pushing construction.

The latest reports show an increase of 35 per cent in permits granted in the East Bat Section for the month of August, 1919, compared with August, 1918.

San Francisco reports a general building boom throughout the city.

Sacramento is about to launch a $3,200,000 school bond issue, and a home-building campaign has been organized in that city, with a program calling for 360 new homes at a cost of $1,400,000.

The greatest detriment to industry on the West Coast is prohibitive freight rates on sand and gravel. It is not only threatening to destroy the industry, but at the same time it is impeding highway construction and other building projects which demand a high grade of these materials.

War Organization Formed by Dutch Government to Handle Building Material

THE CENTRAL Building Materials Supply Bureau of the Dutch Government, which was abandoned several months ago, has been replaced by a limited liability company called the Central Building Materials Supply Co.

This company has a share capital of 3,000,000 florins (about $1,200,000), divided into shares of 10,000 florins (about $4,000) each. Practically all of the capital is owned by larger municipalities in Holland.

The object of the company is to buy, sell, work up, and prepare building materials of all kinds. The profits of the company are employed in the first place to pay 5 per cent to the shareholders, any balance left over after this dividend is paid out being added to the reserve fund. This addition to the reserve fund is to continue until the fund is equal to the paid-up capital; any balance which then remains will be distributed as dividends.

The Central Building Materials Supply Co. is essentially a war organization; it is in effect a co-operative organization which has been brought into life with a view to serving the public interest. There is considerable opposition to the company from the side of private capital, and it is the announced intention of the directors to hold a general shareholders' meeting when the abnormal war conditions have somewhat disappeared for the purpose of deciding whether or not the company should liquidate.

A Farm Paper's Opinion of the Fineness of Agricultural Limestone

Opposes Generally Accepted Theory that Fine Ground Material is the Only Economical Kind to Apply

UNDER THE TITLE, "How Fine Should Limestone Be Ground?" the editor of the "Progressive Farmer" (Birmingham, Ala.) writes as follows:

"When the use of ground limestone first began to take the place of burned lime it was generally ground quite fine. It was known that the finer it was ground the larger the amount that would become quickly available. Later, when it was realized that owing to its cheapness more was usually applied than was necessary for immediate use and that some might be lost by leaching, the tendency was to use less finely ground limestone.

"This was thought advisable for several reasons. First, it cost less, the finer grinding adding considerably to the cost. Second, since it is a cheap and heavy material, the cost of applying is a considerable part of the total cost of liming, and for this reason it appeared economical to apply a larger quantity of the less finely ground limestone so that less frequent applications would be necessary. This could be more safely done with the coarse material, because it dissolved less readily and there was less loss from leaching.

"There has always been a disposition on the part of many manufacturers and some chemists to favor the finely ground material, but we believe this is a mistake. It seems to us that those who insist on finely ground limestone fail to appreciate the economic importance of less frequent applications. If we consider the cost of two applications of finely ground limestone against the cost of one application of more coarsely ground material, it will readily be seen that with the cheaper and coarser product a very much larger single application could be made. If a larger application of a medium product as to the degree of fineness is used, we believe the immediate needs of the soil will be met at a considerably lower cost.

"At a recent conference held at Knoxville, Tenn., attended by lime crushers and representatives from the Experiment Stations of the Southeastern states, the following recommendation is made with reference to the fineness of grinding:

"The finer the limestone is ground, the greater is its immediately availability. Limestone ground to pass through a ten-mesh screen, all finer particles included, is recommended for the common application of two tons per acre. Either very finely pulverized limestone or burnt lime is recommended where an application of only a few hundred pounds per acre is made.

"This recommendation shows the influence of the lime crushers and the chemists, who have generally advocated finely ground limestone. Why should any one apply only a few hundred pounds per acre of a cheap product like lime?

"But the chief purpose in calling attention to this matter is found in the fact that the advocates of finely ground limestone have taken this recommendation as supporting their advocacy of finely ground limestone. The recommendation has that appearance to the casual reader, and therein is shown the influence of the crushers and chemists in its composition; but as a matter of fact, limestone that will "pass through a ten-mesh screen, all finer particles included," is not finely ground limestone. It is what might be described as medium ground limestone.

"These recommendations also advocate the application of one to two tons, supposedly of this sort of crushed limestone, "once in a rotation of not more than five years."

"If one to two tons per acre of crushed limestone, all of which will pass through a ten-mesh-to-the-inch screen, is sufficient for an acre for five years, two to four tons per acre of a crushed limestone, ranging from dust up to a quarter of an inch, ought to last eight or ten years, and we have no hesitation in stating that this heavier single application would cost less than two applications of the more finely ground product, applied once every five years, will give a larger profit on the cost of applying, or a larger net profit than a larger quantity of more coarsely crushed limestone less frequently, of course, the more finely ground material should be used. But lime is a cheap, heavy product, and the cost of applying is a large part of the total cost, therefore, if less frequent applications of a more coarsely ground product will give as good results, no considerations of the crushers or prejudices of the chemists should prevent its use.

"But again to the chief purpose of this article, this conference did not recommend 'finely ground' limestone, as some are claiming, except as an alternative to burnt lime, when 'an application of only a few hundred pounds per acre is made,' a thing which no man who studies economy will do. Since the conference mentioned "finely pulverized limestone," it shoud have defined what it meant by "finely pulverized," for then the sellers of finely pulverized limestone products could not have used its pronouncements to support their erroneous contentions."

THIS ARTICLE is reprinted from the "Progressive Farmer," an agricultural weekly with a large circulation in the South. It is a good sample of the kind of arguments that the promoters of agricultural lime must meet. It apparently ignores the fact that the farmer who buys limestone screenings because they are the cheapest in first cost also pays freight, carts and distributes a material a good proportion of which will not be available for 100 years or more. There is certainly no danger of ¼-in. limestone pebbles "leaching out" of the soil. They will probably be there for the farmer's great grandchildren.

Maybe Rock Products Laborers Are Becoming Proprietors

ITALY HAS EXCELLENT CEMENT ROCK, and its production of lime and cement is growing rapidly. The industrial census of 1911 showed that in the lime, cement and allied industries there were 1,661 establishments employing 18,827 persons and having an output valued at $5,100,000. Since that time the industry has made considerable progress, and with plenty of fuel there is no reason why Italy should not become a great exporter of cement. As the situation has stood the past nine years, imports of cement have been exceeded by exports. Heretofore most of the cement exported by Italy has gone to its colonies in Africa.

NEW MACHINERY AND EQUIPMENT

Standard Testing Sieves for Sand and Gravel

THE INTEREST sand and gravel producers are taking in specifications for these products and the proposals to standardize sizes give new interest to mechanical analysis of sand and gravel by means of testing sieves. The gravel plant owner and operator should be sufficiently well posted to be able to make analyses of his own product, not only to know how he can meet proposed specifications for standard sizes and mixtures, but to be able to lay out his screening plant in the most efficient manner for the material he has to handle.

The time hasn't come yet for sand and gravel plants to have "laboratories," but it is not a wide reach of the imagination to see the time when commercial plants will at least be able to make accurate mechanical analyses of their outputs and to merchandize the material with such descriptions of the product as will satisfy the engineer, architect or contractor that the material offered is better and consequently worth more than some that he could dig up by the side of the road.

Testing Sieves

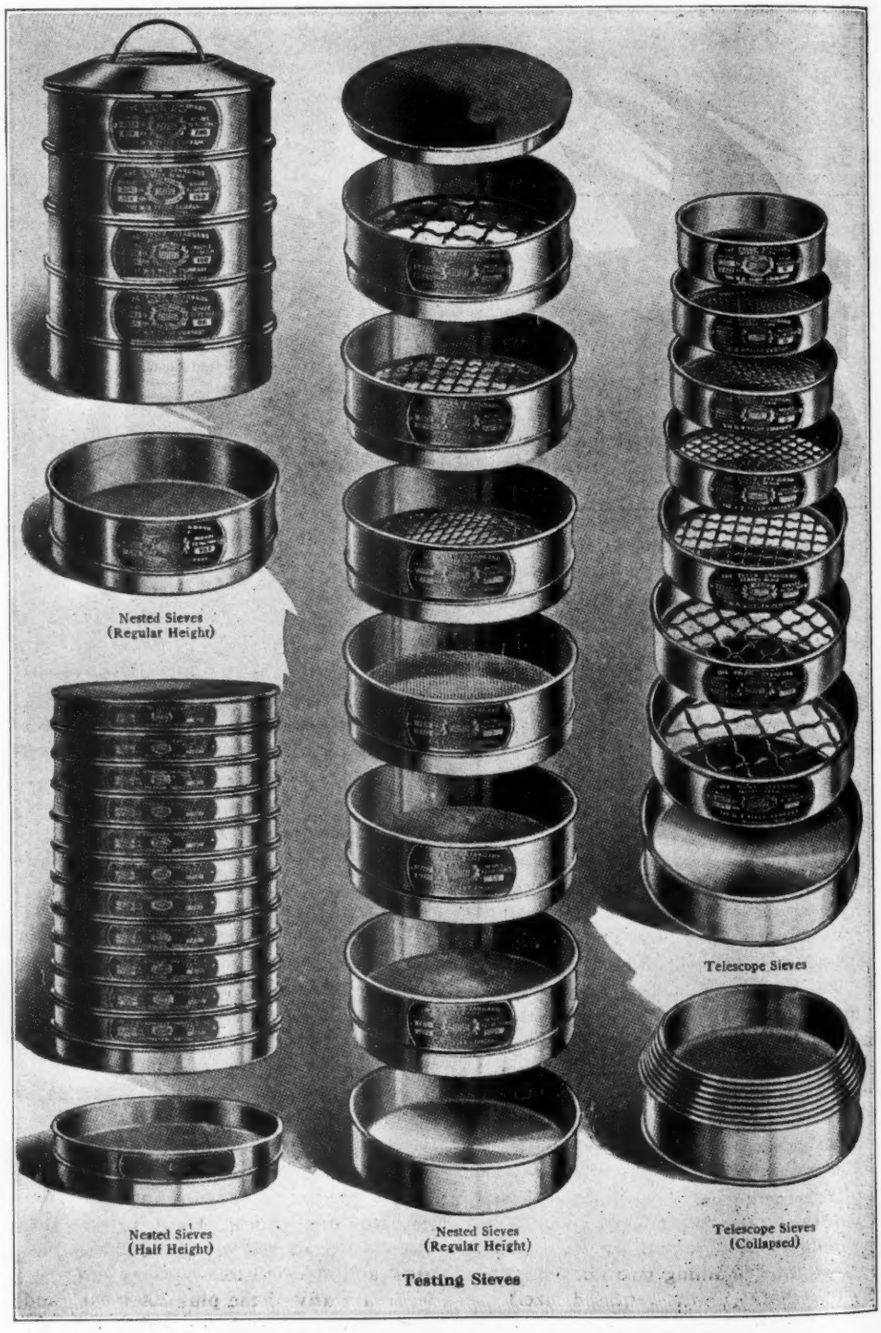
So-called laboratory testing sieves are made up generally in the shape of cylindrical pans with bottoms of different size wire screens. The diameters of the sieves vary from 6 to 12 in. and the wire mesh from a 1-in. opening to 300 meshes to the square inch. Sand and gravel producers, of course, would seldom have use for a sieve of finer mesh than 100 to the square inch.

Obviously, comparisons can not be made between different materials unless the sieves used to compare them are the same, not only as regards size of mesh, but also the size of wire used to make them. The W. S. Tyler Co., Cleveland, Ohio, has given the subject of testing sieves a great deal of study in connection with mining practices and has devised a standard screen scale which agrees in the main with that adopted by the United States Bureau of Standards.

This screen scale has as its base an opening of 0.0029 in., which is the opening in 200-mesh 0.0021-in. wire cloth. The ratio between the different sizes of the screen scale has been taken as 1.414, or the square root of 2, according to experience gained in mining practice. What follows describing these testing sieves and their use is mainly from a recently issued bulletin of the W. S. Tyler Co.:

"This constant ratio in the openings is shown drawn to scale. To illustrate: the opening 0.093-in. in the (8-mesh) sieve is 1.414 times the opening in the preceding sieve 0.065-in. (10-mesh). The area of the opening in 0.093-in. (8-mesh) sieve is twice that of 0.065-in. (10-mesh) and just half the area of the opening in the 0.131-in. (6-mesh) sieve.

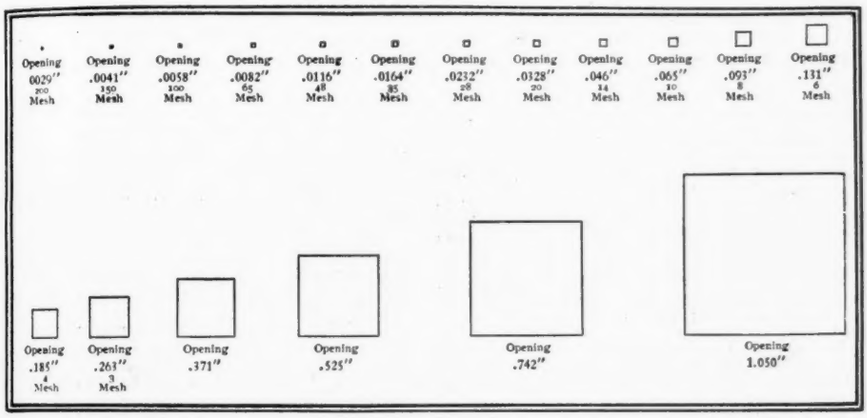
"Another advantage in this selection of ratio is that by skipping every other screen, you have a ratio of diameter of 2 to 1; by skipping two sizes you have a ratio of 3 to 1 (approximately), and by skipping three sizes you get a ratio



Nests of testing sieves for analyses of sand and gravel aggregates

of 4 to 1, so that in selecting a screen scale for concentrating work, for instance, you can pick out from the table without any calculation a 1.414, 2, 3, or 4 to 1 ratio of opening."

The commercial sizes of sand and gravel which correspond with these sieves are: Material passing a ¼-in. screen (3-mesh); the next larger, which has an opening 0.37-in. square (approximately ⅜-in.); the next, with a 0.52-in. opening, or approximately ½-in.; the next 0.742-in., or ¾-in., and the 1-in.



Relative sizes of meshes—slightly less than actual scale

While these are the commercial sizes it is generally desired to separate out, it by no means follows that a complete analysis using the full set of screens from 1-in. to 100-mesh would not be desirable. The present commercial sizes are the result of arbitrary practice and convenience, rather than of a scientific study of the best for the results desired.

Suggestions for Testing

"Where it is not necessary to test all of a sample, it is good practice to use 100, 250, 500 or 1,000 grams, as the results in weights can easily be turned into 'per cents.'

"In taking a small sample from a larger quantity, for a screen test, it is very necessary that great care should be taken to have the sample to be tested a fair or average sample. (The sampling of large lots may best be done by taking every alternate shovelful, or every second, fifth or tenth, according to the size of the lot and repeating this till the sample is reduced to 75 or 100 lbs. From this point on the sampling can best be done with a sample-splitting device, but failing apparatus for this purpose, spread the material on a sampling sheet, mix thoroughly, spread out in a circle to a uniform thickness, mark off into four quarters, reject any two of these opposite quarters, and repeat the same operation on the remaining two until the sample is reduced to the required size.)

"Great care should be taken not to lose any of the product in the testing process; however, the loss can not be entirely eliminated. There are three methods in common practice of overcoming this small percentage of loss. One is to start the test with a sample from one to three grams overweight. By experience this quantity can be very definitely determined so that the final quantities will show 100, 250, 500 or 1,000 grams as required. The larger the sample, the larger the loss will be, so that if a sample weighing 1,000 grams be used, it would be well to start with 1,003 grams. Another method is to divide the loss in proportion to the weight of the different products. Still another method is to assume that the loss is in the fines, i. e., the minus 200-mesh product.

"To save time in testing it is well to place the various sieves to be used in one nest, the coarsest opening at the top of the nest. Place the sample to be screened in the top sieve. The sieves can be roughly shaken in this method and as the product works down through the finer sieves, they will not be overloaded and a quick separation obtained. After shaking the sieves roughly, each sieve should then be shaken separately over a pan to make sure the separation is complete. The sieves should be shaken anywhere from four to ten minutes, the time varying as to the fineness and quality of the product, also the amount of screen surface in the sieve. For ordinary laboratory work, it is often customary to place a light washer in each sieve to help in keeping the mesh free and the product stirred up, so that it will more rapidly pass through.

"The above has reference to the making of dry screen analyses, but it is considered by many authorities to be better practice wherever possible, to make all screen analyses by the wet method. This may be done by first removing all of the clay and slimy matter by repeated washings and decantations, taking care not to decant any of the plus 200-mesh sands and then individually screening each size under water.

"In wet testing, the sieve should be submerged just so that the water will cover the product in the sieve, the wave-like motion of the water washing the material through the sieve as it is moved back and forth. By using the wet process, all of the fines will be washed out of the product much more thoroughly than they can by being dry screened."

Use of Analyses

The percentages of material passing one sieve but retained on the next are best studied in relation to one another by plotting them on cross-section paper, or on specially prepared "curve" paper.

A study of these data on samples taken from different parts of the pit will enable an operator to determine the average physical character of the material he has to deal with and how best to prepare it to meet certain or specified requirements.

Sieve analyses of so-called "concrete-mixes" by this method undoubtedly would show very diverse results as to the effectiveness of the different mixes. The operator with a particularly good analysis could take commercial advantage of it, while the operator whose material showed up to a disadvantage could undoubtedly improve it by manipulation of his screening and washing plant.

The time may yet come when the sand and gravel plant operator will make daily analyses and thus insure his product against rejection by the engineer or architect.

Low Gear Ratio Advisable When Using Motor Trailers

LONG DISTANCE HAULING between cities has developed into a thriving business in almost all sections of the country where roads are passable. In many places, where roads are good and grades not too stiff, truckmen are finding it possible to haul somewhat more than the ordinary capacity of their trucks and to use trailers to add to the profits of the trip. In cases of this kind a low gear ratio is considered advisable by truckmen, to enable the truck to start the heavy loads with ease and to handle the load on stiff grades.

A concrete example of this condition is found in trucking problems which were met by the Leonhardt Truck Co. of Los Angeles, California. The company uses a 3½-ton Federal truck and a four-wheel trailer in their regular operations from Venture to Los Angeles over the Sarta Susan Grade. This grade is three miles long and contains as high as a 12 per cent grade.

This truck has been in constant operation for the past eight months over this route and has regularly been loaded with five tons, with the trailer carrying seven tons.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Bound Brook, N. J.	1.00	2.00	1.70	1.60	1.50	
Buffalo, N. Y.		1.00@1.10 per ton, all sizes				
Burlington, Vt.	1.25		3.00	1.75@2.00	1.75	
Chaumont, N. Y.		1.75	1.65	1.35	1.25	1.25
Coldwater, N. Y.			Flux, 1.50@2.10			
Limekiln, Md.	.75	1.85	1.65	1.50	1.25	1.10
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00‖
Walford, Pa.	1.25	1.40	1.50	1.50	1.50	1.50
CENTRAL:						
Alden, Ia.	.40		1.00	1.00	1.00	
Alton, Ill.	1.80		1.40	1.35		
Anna, Ill.		1.00@1.25 for prepared sizes				
Belvidere, Ill.		1.00 for any size produced				
Brillion and Sherwood, Wis.	.90@1.00		1.00	1.00		1.00
Buffalo, Ia.	.70	1.15	1.05	.95	.95	
Chicago, Ill.	.90@1.15	1.00@1.25	.90@1.15	.90@1.15	.80@1.00	.80@1.00
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*		
Dundas, Ont.	.65	1.20	1.20	1.20	1.00	1.00
Eden and Knowles, Wis.	.80@1.00	.80	1.00	1.00	1.00	1.00
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Greencastle, Ind.	1.00@1.25	1.10	1.00	.90	.90	.90
Illinois, Southern	2.00	1.25	1.25	1.25	1.10	
Kokomo, Ind.			.90@1.00 all sizes			
Lannon, Wis.			1.00 all sizes			
Mankato, Minn.			(1-in. 1.50)		(2-in. 1.25)	
Mayville, Wis.	.75	.75@ .90	1.00	1.00	1.00	1.00
McCook, Ill.	.90@1.10	1.50	.80@1.00	.70@ .85	.70@ .80	.70@ .80
Oshkosh, Wis.			1.00 per ton, all sizes			
Ottawa, Ont.	2.50	2.75		2.25	2.00	
River Rouge, Mich.	.95	1.15	1.15	1.15	1.15	1.15
Sheboygan, Wis.			1.00@1.10 for all sizes			
Stone City, Ia.	.50		(1-in. 1.40)	1.30	1.20	
Toronto, Can.	Above 2 in., 1.90; 1 in. to 2 in., 2.00; less than 2 in., 2.10					
SOUTHERN:						
Brooksville, Fla.	1.00			2.60		
Cartersville, Ga.		1.95		1.85	1.75	
Fort Springs, W. Va.	1.00	1.20	1.40	1.60	1.40	
Irvington, Ky.			1.00	1.00	1.00	1.00
Mascot, Tenn.		1.00@1.25		1.50	1.50	
Memphis Junction, Ky.			Average 1.10			
Winnfield, La.	.60	1.60	1.60	1.60	1.60	1.75
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.70	1.70
Blue Springs and Wymore, Neb.	.15	1.65	Rip-Rap, 1.30 1.65	1.55	1.45	1.40
El Paso, Tex.			1.00 for all sizes			
Kansas City, Mo.	.60	1.40				
New Braunfels, Tex.	.60	1.25@1.50	1.00@1.30	1.00@1.25	.90@1.10	

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.50	1.50	1.20	1.10	
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Castro Pt., Richmond, Cal.	.50*		1.50*	1.50*	1.40*	
Duluth, Minn.	.50@.65	1.50	1.35	1.15	1.15	1.00
Farmington, Conn.		1.05	1.05	1.05	.95	
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Little Rock, Ark.	1.75	2.50		2.00	1.50	1.35
Millington, N. J.	1.80	1.80	1.80	1.60	1.00	
New Britain, Conn.	.75	1.40	1.35	1.35	1.00	
Oakland, Calif.		1.75*	1.75*	1.75*	1.75*	
Rock Hill, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Westfield, Mass.	.60	1.20	1.10	1.00	.90	
Winchester, Mass.	.75	.75	1.60	1.45	1.25	1.25‖

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Fair Oaks, Calif.—Cr. Bldrs.	.85	1.05	.95	.85	.85	
Hendlers, Pa.—Quartzite	.80	1.00	1.25	1.00	1.00	1.00‖
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20	1.20‖
Middlebrook, Mo.—Granite	3.50		1.75	1.75		1.00‡
Portland, Maine—Granite	1.50			1.35	1.25	
Roseburg, Ore.		1.50	1.25	1.05	1.00	1.00
Redington, Pa.—Dolomite	1.00	1.10	1.10	1.10	1.10	1.10‖
Smith Siding, Richmond, Va.—Granite	1.25		1.50	1.50	1.50	
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20‖

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone Wholesale at Plant, per Ton

EASTERN:

Coldwater, near Rochester, N. Y.—Analysis: $CaCo_3$, 56.77%; $MgCo_3$, 41.74%—80% thru 100 mesh; ppr., 4.50; bulk — 3.00

Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); ppr., 4.00; bulk — 2.50
Paper bags — 4.00

Cobleskill, N. Y.—Ppr., 5.00; bulk — 3.00

Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk — 3.25

Grove, Md.—90% thru 4 mesh; bulk — 3.00

Hillsville, Pa.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 1½%—(70% thru 100 mesh) in 80 lb. ppr. bags, 4.25; bulk — 2.75

Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk — 2.25

Lime Kiln, Md.—50% thru 50 mesh; bulk — 4.00

Pownal, Vt.—(50% thru 100) Analysis, $CaCo_3$, 90%; $MgCo_3$, 5%; ppr., $4.50; bulk — 2.75

Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk — 2.75

West Stockbridge, Mass. — Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk — 2.85

CENTRAL:

Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—90% thru 100 mesh.. — 3.00
50% thru 50 mesh — 2.00

Anna, Ill.—Ground; bulk — 1.25

Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, 98.5%; $MgCo_3$, 0.5% — 1.75

Canton, O.—100% thru 10 mesh; 49% thru 100; 59% thru 50 — 3.00
80 lb. bags — 4.80

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh — 1.00

Columbia, Ill., near East St. Louis —(½" down) — 1.25@1.80

Ellettsville, Ind.—Analysis, Carbonate, 98% — 2.00

Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh — 1.25

Greencastle, Ind.—(Analysis, $CaCo_3$, 98%) 50% thru 50 mesh — 1.75

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 — 2.75@3.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ — 2.00

Marble Cliff, O.—(50% thru 100 mesh) Analysis, $CaCo_3$, 86%; $MgCo_3$, 8%.. — 2.50

Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 50% thru 100 mesh — 3.00@4.50

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼" sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100 — .90@1.00

Milltown, Ind.—Analysis, $CaCo_3$, 94%; $MgCo_3$, 3% — 1.50

Monon, Ind. — 1.25

Montrose, Ia.—(90% thru 100 mesh).. — 1.25

Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.8%—30% thru 100 mesh; 100% thru 20 mesh — 4.00

Muskegon, Mich.—(90% thru 50 mesh) Analysis, $CaCo_3$, 53.35%; $MgCo_3$, 43.27% — 2.50

Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—70% thru 100 mesh, bulk — 2.50@4.00

Rockford, Ill. — Analysis, $CaCo_3$, 53.75%; $MgCo_3$, 44.35% — 1.25

(Continued on next page.)

Agricultural Limestone Wholesale at Plant, per Ton

(Continued from preceding page.)

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12%	1.50
Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ⅛" mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82%	1.50
Stone City, Ia.—(90% thru 50 mesh) Analysis, $CaCo_3$, 98%	.50
Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh; 30% thru 50; 80% thru 100; 100% thru 5/32 screen)	1.80
Whitehill, Ill. — Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—	
50% thru 50 mesh, bulk	2.00
90% thru 100 mesh	5.00
SOUTHERN:	
Dittlinger, Tex. — Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%.	
90% thru 100 mesh	2.00
90% thru 4 mesh	1.00
Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh	2.50
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk	2.00
Irvington, Ky.—(90% thru 50 mesh)	2.00
Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%) average price	2.00
Cartersville, Ga.—Analysis: 96 to 98% combined carbonates—All thru 10 mesh with all dust in	2.50
Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.	
(80% thru 100 mesh)	2.50
(All thru 10 mesh)	2.00
80% thru 200 mesh	3.50
Paper bags $1.50 extra per ton; burlap, 2.00 extra per ton.	
Maxwell, Va.	2.50
Tyrone, Ky.—Analysis, $CaCo_3$, 93%; $MgCo_3$, 6%—90% thru 4 mesh	2.25
Winnfield, La.—(90% thru 50 mesh)	3.00
WESTERN:	
Fresno, Calif.—(Analysis, $CaCo_3$, 94%; $MgCo_3$, .02%) 50% thru 200 mesh; 90% thru 100; 100% thru 40. Prices for delivery: Sacks, 6.50; bulk Sacks, 10c each.	6.00
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk	1.35

Miscellaneous Sands per Ton at Plant

Silica sand is quoted washed, dried and screened, unless otherwise stated.

GLASS SAND:	
Berkeley Springs, W. Va.	2.00@2.10
Special hand selected rock	2.50
Cedarville and South Vineland, N. J.—	
Glass, damp	2.00
Glass, dry	2.50
Gray Summit, Mo.	2.00@2.50
Guion, Ark—Glass on contracts	1.50
Hancock, Md.—Engine and glass	2.50@3.00
Klondike and Pacific, Mo.:	
Contracts	2.00
Car lots	2.50
Mapleton, Pa.	2.50
Glass, damp	2.00
Massillon, Ohio	3.00
Millington, Ill.	1.75
Mineral Ridge, O.	2.75
Montoursville, Pa.—Green, washed	2.75
Ottawa, Ill.	2.00
Large contracts	1.75
Robinson, Md., washed, screened, not dried	2.00
Sands, Elk Co., Pa.—Selected, green	2.50
Thayer, W. Va.—Washed	2.25
FOUNDRY SAND:	
Albany, N. Y.—Core	1.50
Molding fine	2.00
Molding coarse	1.80
Brass molding	2.00
Sand blast	3.75
Allentown, Pa.—Core	1.50
Molding, fine	1.40@1.50
Molding, coarse	1.25
Arenzville, Ill.—Molding fine	1.50
Berkeley Springs, W. Va.—Roofing	2.00
Bowmanstown, Pa.—Core	1.25
Molding fine or coarse	1.50
Traction	1.25

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.60	.60	.60	.75	.75	.75
Boston, Mass.	1.65	1.10	2.25	1.75	1.75	1.60
Farmingdale, N. J.		.43	1.25	1.15	1.05	
Morristown, N. J.	.60	.60	1.20	1.00	1.00	
Philadelphia, Pa.		.95		1.40	1.25	
Pittsburgh, Pa.		.90@1.00	1.10	.90@1.00	.70@ .80	.70@ .80
Washington, D. C.—Wharves	.75	.75	2.00	1.40	1.20	1.20
West Peabody, Mass.	.35@ .45	.35@ .45	2.00	1.20	1.20	1.20
CENTRAL:						
Alton, Ill.	.75	.75		1.35	1.20	1.20
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.75	.75	.75	.75	.75	.75
Barton, Wis.	.75	.70	1.00	.70	.70	.70
Chicago		1.25@1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Columbus, O.		.65@1.00	1.00	.70@1.00	.70@1.00	.65@1.00
Des Moines, Ia.	.60@1.00	.60	1.50	1.50	1.40	1.40
Earlestead, near Flint, Mich.		.65@ .75			.85@ .95	.85@ .95
Escanaba, Mich.		.90	1.60	1.20	1.00	.90
Fort Dodge, Ia.	1.20	1.10	1.85	1.85	1.85	1.85
Fort Jefferson and Mechanicsburg, O.	.50	.50	.50	.70	.60	.60
Grand Rapids, Mich.	.75@ .85	.60@ .75	1.25@1.35	1.15	1.00	1.00
Grass, Mich.		.90	1.60	1.20	1.00	.90
Illinois, Northern	.50@ .60	.60@ .70	.75	.60@ .75	.60@ .75	.60@ .70
Indianapolis, Ind.	.60	.60		1.50	.75	.75
Janesville, Wis.		.50			.60@ .70	
Mason City, Ia.	.70	.60	1.55	1.50	1.40	1.35
Milwaukee, Wis.			1.20 for all sizes			
Minneapolis, Minn.	.50	.50	1.75	1.50	1.35	1.35
Moline, Ill.	.60	.60@ .80	1.00@1.20	1.00@1.10	1.00	1.00
Montezuma, Covington, Ind.	.75	.75	.85	.75	.75	.75
Oxford, Mich.					.85	
Rockford, Ill.	.60		.75	.75	.75	.75
Saginaw, Mich. (River Sand)	1.05	1.05	1.85	1.60	1.60	1.45
St. Louis, Mo.	(Mississippi sand, 1.90; Meramec river sand, 1.95)					
St. Louis, Mo., F. O. B. cars	1.35	1.20	1.50	1.30		1.25
Summit Grove, Ind.	.75					
Terre Haute, Ind.	.75	.75	.85	.75	.75	.75
Winona, Minn.		.70	1.60	1.10	1.10	1.10
SOUTHERN:						
Knoxville, Tenn.	.85	.85	1.50	1.50	1.50	1.20
Lake Weir, Fla.	.50					
Macon, Ga.		.75				
New Martinsville, W. Va.	1.30	1.00@1.10		1.20		.70@ .80
Pelzer, S. C.	.65					
Roseland, La., and Condron, Miss.		.40	1.00	1.00	1.00	1.00
Thomas, La.	.60					1.75
Waco, Texas	.70@ .80	.70@ .75	1.10			1.10
WESTERN:						
Kansas City, Mo.	.60	.60	(Kaw river sand retail 1.50 per cu. yd.)			
Lincoln, Neb. (on cars)	1.00	1.00	2.10	2.10		1.90
Niles, Calif.		.50@ .75	.50@ .75	.50@ .75	.50@ .75	.50@ .75
Pine Bluff, Ark.	1.00	.90			1.30	
Pueblo, Col.	.80*	.60*			1.50*	
Roseburg, Ore.	1.50	1.00	1.25	1.00	1.00	1.00
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25*	1.25*	2.00*	1.25*	1.25*	1.25*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60	.50@ .65				.65
Burnside, Conn.	.80*					
Lowell Junction, Mass.	.75*	.65*@.75*	.60*			
Yardville, N. J.		.50@ .75				
York, Pa.		1.00@1.10	(crushed rock sand)			
CENTRAL:						
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.60	.60	.60	.60	.60	.60
Des Moines, Ia.	Washed concrete mix., 25% gravel, .80; 50% gravel, 1.00					
Earlestead, near Flint, Mich.	.55@ .65					
Escanaba, Mich.			1.00 cu. yd., all sizes			
Grand Rapids, Mich.	.60			.75		.60
Grass, Mich.			1.00* (all sizes)			
Hersey, Mich.	.50			.50	.50	.50
Illinois, Northern						.50@ .60
Indianapolis, Ind.	Washed concrete, mix, .65					
Janesville, Wis.					.55	
Montezuma, Terre Haute, Ind.					.60	.60
Oxford, Mich.					1.00	
Rockford, Ill.	Sand and Gravel mixed, .55@.65					
Saginaw, Mich. (Incldg. frt.)	1.05	1.05	1.20	1.20	1.20	1.20
Summit Grove, Ind.	.50					
Wabash Valley District, Ind.	.60 for all sizes					
Winona, Minn.	Pit run gravel under 2-in., .70					
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)	.95	.90		1.00		
Lindsay, Texas		1.50			.50	
Pine Bluff, Ark. (Road Gravel)					.45	
Thomas, La.						.65@ .85
Waco, Texas						.67
WESTERN:						
Pueblo, Colo.	.60*		River Run, .60 unscreened			
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ore.		.40			.40	

* Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag Wholesale at Plant Per Ton

City or shipping point	Roofing	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Buffalo	2.00	.85	.85	.85	.85	.85	.85
E. Canaan, Conn.	4.00	1.00	1.50	1.15	1.00	1.00	1.00
Erie, Pa.	1.75	.85@1.00	1.00@1.50		1.00	1.00	1.00
Emporium, Pa.		1.00	1.00		1.00	1.00	1.00
Ensley, Ala.	2.05	.90		.90@1.20	1.00	.90	.85
Hokendaugua and Topton, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Lebanon (Donaghmore), Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia Dist.	2.50	.75	1.50	.85	.85	.85	.85
Pittsburgh, Pa. (East)	2.05	1.10	1.50	1.10	1.10	1.10	1.10
Pittsburgh, Pa. (West)	2.25	.75	1.50	.85	.85	.85	.85
Sharpsville, Pa.	1.75	1.00	1.25	1.00	1.00	1.00	1.00
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton and Jackson, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	All sizes, 2.00, F. O. B. Toledo						
Youngstown, Dover, Hubbard, Leetonia	2.00	1.10	1.50	1.10	1.10	1.10	1.10

Agricultural Lime and Hydrate at Plant Per Ton

	Agricultural Lime—Bulk	Agricultural Lime—Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		7.50@8.00	65		
Berkeley, R. I.		16.00	45	15	
Bellefonte, Pa.	7.25		95.5	.72 to .89	
Bridgeport, Pa.	7.50		55	44	10.25
Cavendish, Vt.	2.50 bbl. in car lots				
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	10.75
Chippewa, Lycoming Co., Pa.	5.00@5.50		78.67	1.33	
East Sparta, O.					9.00
Espy, Pa.	4.50		82	1.25	
Farnams, Mass.	5.00	7.50			
Frederick, Md.	8.00				10.50
Grove City, Pa.	7.00 lmp.	9.00 grd.	75.48	0.80	10.00
Grove, Md.	8.00				10.75
Highgate Springs, Vt.		8.00	85	2	
Hollidaysburg, Pa.	6.50		94.25	.30	
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Bluff, Pa.	5.00@6.25		78.67	1.33	
Lime Ridge, Pa.	5.00@6.25		80.56 to 62.56	3.87 to 1.75	
Mt. Union, Pa.	4.13		96.6		
Munns and Blakeslee, N. Y.	3.00	4.50	53.0		
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Ottawa, Ont.	12.00		95	1.5	
Paxtang, Pa.	5.00		60	12	
Rosedale, N. Y.	8.00		96	5	(Bulk, 6.00)
Steuben, Pa., Dover Plains, N. Y., York, Pa.		7.00@9.50	70		10.75 to 12.00
Union Bridge, Md.	8.50		73	1	10.75
West Rutland, Vt.	5.00	7.50	68	3	10.00
Williamsport, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
Williams Station, Pa.	7.50		60.6	39.1	9.75@10.50
York, Pa.	8.00		90 to 95	2 to 7	10.75
Zylontte Station, Adams, Mass.		8.00			
CENTRAL:					
Delaware, O.			50	5 to 12	8.50
Forest, O.	7.50				
Manistique, Mich.		10.00	54 & 95	40 & 1.75	10.00
Marblehead, O.	2.25	3.75			8.75
Mitchell, Ind.	9.00				11.00
Springfield, O.			33.62	17.73	9.00
Woodville, Ohio		9.25	46 to 48	30 to 34	9.25
SOUTHERN:					
Burns, Tenn.	8.00		95.6	0.54	11.00
Chippewa, Fla.	5.00		80.0	15.0	
Erin, Tenn.	8.00		99		
Hopkinsville, Ky.	3.00	6.50	98.75		
Hot Springs, N. C.	2.70	4.20			
Knoxville, Tenn.	2.00		57	3	
Lineton, Va.	8.50		97	1.74	
Louis Brook, Va.	8.00	10.25	90	1	
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	4.50		82	1.75	
Newala, Ala.	8.50@9.00		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98½ (dry basis)		
Staunton, Va.	6.50	9.00	93	5.5	
WESTERN:					
Bellins, Wash.					12.00
Colton, Calif.	4.50		95 to 97	1.5 to 3.0	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Kirtland, N. M.	10.00				
Knowles, Wis.	8.00	9.50	55	45	9.50
Lime, Ore.	15.00		91.48	0.58	
Oscas Island, Wash.		5.50			16.50
San Francisco, Calif.					15.00
Tehachapi, Cal.	6.00	8.00	96	2	

Miscellaneous Sands per Ton at Plant

(Continued from preceding page)

Cedarville and So. Vineland, N. J.—Core, damp	2.00
Core, dry	2.50
Cleveland, O.—Core	1.00@1.50
Molding fine, molding coarse	1.75@2.25
Brass molding	1.50@2.50
Delaware, N. J.—Molding	1.50@2.00
Dundee, Ohio—Molding, steel	1.75
Eau Claire, Wis.—Core	2.25
Roofing sand	3.00
Brass molding and sand blast	2.25
Fleetwood, Pa.—Furnace lining	2.15
Refractory silica	2.15
Franklin, Pa.—Core, traction and brass molding	2.00
Molding, fine	2.00
Molding, coarse	1.50@1.75
Gray Summit, Klondike and Pacific, Mo.—Molding fine	1.50@2.00
Greenville, Ill.—Molding coarse red	1.60
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85
Leesburg, Pa.—Core, furnace lining, molding fine and coarse,	2.00
Mapleton, Pa.—Molding, fine and core, damp	2.00@2.50
Molding, fine, dry	3.00
Massillon, O.—Steel molding coarse	2.50
Furnace lining	3.00
Core	2.50
Michigan City, Ind.—Core, bank	.30@ .40
Millington, Ill.—Furnace lining, roofing, stone sawing	1.75
Core	1.50
Mineral Ridge, O.—Core, molding, sand blast, roofing, brass molding, etc., washed, screened (damp)	2.10
Montoursville, Pa.—Core, molding fine, traction, brass molding	1.25@1.75
Ohio—Various points:	
Iron molding, fine	1.50@2.25
Iron molding, coarse	1.75
Brass molding, minimum	2.00
Ottawa, Ill.—Sand blast	3.50
Core, furnace, steel molding	2.00
Roofing sand	2.00@3.50
Stone sawing	1.50@2.00
Providence, R. I.—Core	2.00
Molding fine	2.00
Molding coarse	1.80
Brass molding	2.00
Sand blast	3.50@4.00
Sugar Grove, Ohio—Core (dried and screened)	2.00
Traction	2.00
Thayers, Pa.—Core and traction	1.75
Furnace lining, molding	1.25
Utica, Pa.—Core	2.00
Molding coarse, steel	2.00
Traction	2.00
Brass molding	2.00
Warwick, O.—Core	2.00
Furnace lining, green	2.00
Molding, fine	2.00
Molding, dried and screened	2.25
Green	2.00
Wedron, Ill.—Core, (crude silica)	.75
Furnace lining, molding fine	.75
West Albany, N. Y.—Molding fine	1.75@2.25
Molding coarse	1.50
Brass molding	1.75
Zanesville, O.—Molding fine	1.50@2.00
Traction	.75
Molding coarse	1.25@1.50
Brass molding	1.50@2.00

Ground Gypsum Rock, per Ton, at Plant

Castalia, O.—Raw, to cement mills	3.50
Crushed, not ground	3.00
Land plaster	6.00
Fort Dodge, Ia., bulk	4.00
Garhutt, N. Y.—Land plaster, bags	7.00
Grand Rapids, Mich.—Crushed gypsum	6.00
Ground gypsum rock	7.00
Gypsumville, Man., Can.	3.00
Oakfield, N. Y.	7.00
Sandusky, O.	6.00

Jute sacks, $3.00 extra; paper, $1.00 extra.

Ground Rock Phosphate at Plant, per Ton

Centerville, Tenn.—B. P. L., 60% to 70%; ton, 2240 lbs. Ground rock phosphate (90% thru 100 mesh)	8.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 70%	7.75@8.00
B. P. L., 78%	8.00
Gordonsburg, Tenn.—B. P. L., 72%; ton, 2240 lbs. Ground 90% thru 100 mesh	8.50@9.00
Lump rock	6.00@7.50
Mt. Pleasant, Tenn—(B. P. L., 70%) 12%	6.00
13%	7.80
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 60% to 70%	8.00@9.50
Nichols, Fla.—Pebble, B. P. L., 70%	10.00
Wales, Tenn.—B. P. L., 70%	7.50@8.50
Walls, Tenn.—B. P. L., 70.2%— To County Agri. Assns.	7.50
To others	7.75

Florida Soft Phosphate

Jacksonville (Fla.) District (Add 2.50 for sacks)	10.00@12.00
Phoslime, Fla. (in burlap bags, 100-200 lbs.)	14.00
Benotis, Fla.	9.00@11.00

General News From the Rock Products Markets

Weekly Analysis of Eastern Market

HEAVY SPOT BUYING of building materials, according to The Dow Service Daily Building Reports, accompanied by the promised settlement of the bricklayers' difference with their employers pending arbitration of wage demands, brought about one of the most general price advance movements that the New York construction market has developed in half a year.

Present indications point to an actual start in the long deferred construction era that has been awaited with general discouragement by the building and material interests of the eastern section of the country since the first of the year. The strongest indication that the change is positive and not figurative is the behavior of building material prices, indicating actual buying, and a survey of the various departments proves that materials and commodities are moving up in price in spot and future buying because the factor of over-demand and undersupply is actually beginning to function. In common brick, window glass and lath actual stampede conditions have developed in varying degrees.

A passing sidelight upon the steel strike as it affects building construction was revealed when one of the best informed men in the fabricated steel department said that the plate mills have been aggressively in the market for orders to keep the fullest capacity of their plants employed at the present time.

Possible relief from the soaring tendency of lumber developed in House Bill 9567, introduced last Saturday and referred to the Committee on the Judiciary prohibiting the exporting of lumber from the United States for a period of two years from the passage of the act. Penalties are limited to the value of the lumber exported. The author of the bills hopes to check the heavy foreign demands upon American lumber resources which has resulted from the lumber embargoes placed by Canada just after the armistice was signed and which embargo is largely responsible for the high price of spruce lath here now.

All basic building material prices moved up during the current week.

Extent of Public Roads

THE PRESENT mileage of public rural roads in the United States is 2,478,552, according to figures of the United States Bureau of Public Roads. Of this total approximately 299,175 miles, or 12 per cent, are surfaced. A large proportion of the mileage is sand, clay, gravel or water bound macadam.

A Center for a Rock Products Industry

ACCORDING to a report by H. J. Parker, manager of the Parker Sand Co., Santa Anna, Texas, that city lies in a very rich deposit of material suitable for the development of almost any kind of a rock products industry.

The top of Santa Anna mountains are covered with a layer of limestone, from 14 to 20 ft. thick, which is suitable for the production of building stone, crushed stone, lime, or the manufacturing of cement. This deposit is near the surface and it is said that it would be easy to work.

A bed of brick shale several acres in extent and 20 ft. in depth makes a very high quality of brick by either the stiff mud or dry press processes.

The Parker Sand Co. owns some 200 acres of a good grade of silica sand 40 ft. deep. At present their output is being shipped to Wichita Falls to be used in the manufacturing of window glass.

It is believed, however, that the town of Santa Anna would make a good site for a glass factory because of the closeness of the high-grade material, the suitability for shipment in either the direction of New Orleans or San Francisco, and the abundance of natural gas fuel and soft water supply.

Since the raw material for the production of glass, lime, crushed stone, cement and brick are all contained on one piece of property, Mr. Parker is anxious to correspond with some one interested in a location for their production.

Illinois Road Contracts for Next Year Start Early

MORE THAN 600 miles of road, it is reported by the Illinois Sand and Gravel Producers Association, are now under contract in Illinois, and at least one more letting will be arranged for some time this month.

It is expected that all work except grading will be stopped about the first of November, and it is now apparent that 50 per cent or more of the contracts awarded this year will be carried over to next season.

The department hopes to get started letting contracts for next year's work as early as January, and it seems very probable that southern Illinois will be first out with a road from Cairo to Carbondale, and additional mileage, location of which has not been decided, equivalent to distance from Carbondale to East St. Louis.

Highway Work Rejected by Large Contractors Because of Low Estimates

ONE OF THE FACTORS which has been of great influence in keeping many of the larger contractors from actively entering the road building field has been the tendency to keep estimates so low as to preclude a reasonable profit.

While the more experienced highway engineers are now getting away from this practice, the great increase in highway construction has caused the preparation of plans and estimates in many cases to fall to the lot of men who are without sufficient knowledge of the subject, and the scarcity of contractors has led firms which have never done such work to bid without a careful study of the situation.

Under these conditions it becomes a frequent occurrence for the inexperienced engineer and the inexperienced contractor to be misled by the glowing accounts of equipment performance given out by machinery salesmen or the low cost figures furnished by material men, with the result that the estimate is too low, the bid is too low, and the contractor's bank account soon becomes too low.—The Associated General Contractor.

Fifth National Exposition of Chemical Industries

THE FIFTH NATIONAL EXPOSITION of Chemical Industries held at the Coliseum, Annex and 1st Regiment Armory at Chicago, during the week of Sept. 22 to 27, was the largest and most successful of any attempted so far.

The large floor space of the Coliseum and balcony and the Armory were completely filled with displays and processes of interest which represented the industry from all parts of the country. Visitors from all over the United States and representatives of some foreign countries were greatly interested and during visiting hours the spacious halls were continually filled.

Among the many interesting things presented were, a limestone display by the American Limestone Co., of Knoxville, Tenn.; a large lime kiln by the Glamorgan Pipe and Foundry Co., Lynchburg, Va.; a new type of the Mitchell Electric Vibrating Screen by the Stimpson Equipment Co., Salt Lake City, Utah; the Cotterall Electrical Precipitation Process for removing and collecting solids and liquids from gases, by the Research Corporation, 63 Wall St., New York City; and the Simplex Process for the recovery of finely crushed material by the W. O. Arzinger Machinery Co., Nashville, Tenn.

General News From the Rock Products Markets

Lime Association Investigates Lime Uses in Paint and Varnish Industries

"IT WILL BE of interest to members of this Association," says a weekly letter of the Lime Association, "to know that one of the old ideas, beliefs, superstitions, rule-of-thumb methods, or whatever you want to call it, pertaining to the use of lime in the varnish industry, is being rapidly exploded, due, in part, to the light which we have been able to shed on this matter.

"In by-gone years the varnish maker in general has believed that there was only one type of lime which he could successfully use for making high-grade varnish and that was oyster shell lime. One of the largest varnish manufacturers, responding to our correspondent, writes in part as follows:

"Some people, as you know, enjoy reading by the light of the tallow-dip—most of us have already gotten beyond that, as far as light is concerned, but not so on other points. Shell lime has long been used by varnish and japan makers very largely for the purpose of neutralizing acids in gums, rosins, etc. One advantage it does have is that it is scaly and precipitates rapidly.

"It now develops that we are able to furnish the varnish manufacturer with information relative to what he may expect from the various limes that he may require in his work and show him that all of the desirable qualities are obtainable in lime produced from rock.

"To those members who are interested in this matter the Chemical Bureau will be glad to send information relative to the use of lime in the paint and varnish industry.

"Burnt lime made from lime rock is now being successfully used in the paint and varnish industry, and by its use a better chemical control of the process of varnish manufacture is achieved. We firmly believe that within a comparatively short time the paint and varnish industry will use no other lime than that produced from rock. By so doing they will receive a supply of practically constant composition free from a large percentage of impurities which habitually exist in oyster shell lime and which have added difficulties to the filtration of varnish. This will make it possible for the varnish manufacturer to place this phase of his work under strict chemical control.

"A complete mailing list of the paint and varnish industry is now available for distribution so arranged as to distinguish between paint manufacturers, varnish manufacturers and those firms which manufacture both paint and varnish."

Rate Increases to be Refunded

IN MANY STATES, contractors who bid on State highway work hereafter will not be called upon to assume the risk of having to pay an increase of 25 or 50 per cent in freight rates on the necessary materials. Replies which have been received from the State Highway Engineers in answer to the letters sent out recently by the Associated General Contractors are practically unanimous in acknowledging the fairness of arranging for an adjustment in case freight rates are increased during the life of a contract.

What is more to the point, they have promised either to incorporate a clause in their contracts providing that contractors shall be reimbursed for the increases in freight charges should rates be advanced, or to recommend to their commissions that such action be taken.

At present such provision for adjustment exists only in Illinois, Wisconsin and Michigan.

Such a clause will be incorporated in contracts for Texas, Georgia, Maine, New Hampshire, Rhode Island, Kansas and Minnesota. In Massachusetts the provision will be contained in contracts requiring freight transportation. The matter has been referred to State commissions of Indiana, New Jersey, West Virginia, Iowa, Tennessee, Colorado, North Dakota, Oregon, and Virginia. Legal restrictions prevent the adoption of such a plan in Ohio and Kentucky.—Associated General Contractor.

Hines Says—"No Readjustment of Rates Now"

WASHINGTON, D. C.—Director General Walker D. Hines announced the decision of the United States Railroad Administration that if railway rates are to be raised it should be done on application of individual railways.

In a letter to T. De Witt Cuyler, chairman of the Association of Railway Executives, the director-general asserts it would be impossible for the government to establish any general readjustment of rates before January 1.

"The question of an increase in rates could not properly be considered on the exclusive basis of the unfavorable showing which the railroad administration was making in the early part of this year, because that showing was largely due to abnormally small freight business," said Mr. Hines. "It has seemed to me that the public would not be satisfied to have any general increase in rates put into effect without the concurrence of the Interstate Commerce commission."

New Express Packing Rules

PREPARATIONS are being made to put the new express packing rules into effect on December 10, the date authorized by the United States Railroad Administration, which recently approved the new requirements.

The new rules were put into effect to induce shippers to turn their business over to the carrier so that it can, with reasonable care on the part of the express company, be handled properly. The rules will not permit the use of paper wrapping for packages over 25 lbs., nor of ordinary paper boxes, wrapped or unwrapped, when the weight of the contents is over that limit. For shipments over 25 lbs., wooden containers, or fibreboard, pulpboard or corrugated strawboard containers of specified test strengths, are required.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Rock Products, published every other week at 542 S. Dearborn St., Chicago, Illinois, for October 1, 1919.

State of Illinois, County of Cook.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Geo. P. Miller, who, having been duly sworn according to law, deposes and says that he is the business manager of the Rock Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation, etc.), of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Tradepress Publishing Corporation. Editor, Nathan C. Rockwood. Managing editor, Nathan C. Rockwood. Business managers, W. D. Callender and Geo. P. Miller, all at 542 S. Dearborn St., Chicago.

2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) Tradepress Publishing Corporation, W. D. Callender, Geo. P. Miller, T. J. Sullivan and N. C. Rockwood, all at 542 S. Dearborn St., Chicago.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) There are none.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

(Signed) GEO. P. MILLER,
Business Manager.

Sworn to and subscribed before me this 26th day of September, 1919.

MABEL OLSEN, Notary Public.

(My commission expires April 11, 1922.)

Passed By The Screens

Incorporations

The Petoskey Portland Cement Co., 456 East Lake Street, Petoskey, Mich., has been incorporated with a capital of $1,500,000 in Wisconsin.

The Montpelier Portland Cement Co., Plattsburg, N. Y., has been organized with a capital of $75,000. L. A. Bellonby is president and general manager.

The Wapello Coal Co., Ottumwa, Ia., has been incorporated to mine coal, oil, clay and rock. The capital is $500,000. Incorporators are H. C. Mackall and H. B. Woodford, Ottumwa, Ia.

The Mechanicville Sand and Gravel Co., Mechanicville, N. Y., has been incorporated with a capital of $13,250. The incorporators are: L. K. Sager, R. Frazier and J. B. Hutchins, all of Mechanicville, N. Y.

The Springtown Crushed Rock Co., McAlester, Okla., has been organized, with R. L. Hatfield, President and General Manager; H. P. Perry, Secretary-Treasurer, both of McAlester, and W. F. Wise, Vice-President, of Dallas, Tex.

The Ralph Gypsum Co., Byron, Genesee County, N. Y., has been incorporated with a capital of $250,000 to operate a gypsum mine and plant. The incorporators are: G. J. Ralph, Akron, N. Y.; G. W. Miler and C. B. Gillett, South Byron, N. Y.

The Daleville Lime and Marl Co., Fincastle, Va., recently organized with $50,000 capital, proposes to establish a lime works in Botetourt County, Virginia, which will have a 60-ton daily capacity. The new plant is to be ready for operation by next spring.

The Chequest Stone Corporation, Des Moines, Ia., has been incorporated to quarry stone and manufacture cement and brick. Its capital is $750,000. The incorporators are: H. L. Stanley, president; Earl Jossen, vice-president, and Wray Bertholf, treasurer and secretary.

The Suffield-Berlin Trap Rock Co., Hartford, Conn., has notified the Secretary of State that the capital stock of the company has been increased from $600,000 to $800,000. The directors who signed the certificate are: J. E. Hastings, J. L. Warner and H. M. Steele.

Sand and Gravel

The Genessee Gravel Co., Earlestead, Mich., report that they are so busy that it has been necessary to reduce the number of commercial sizes to those of which the most can be produced.

Captain W. H. Ellery, Detroit, Mich., has purchased retail business and leases of Marine Contracting Co. and dock property at Port Huron, and has organized the Port Huron Sand & Gravel Co. H. F. Dowker will be secretary and sales manager. Captain Ellery also has a five-year contract to keep the mouth of the canal open.

W. W. Fischer, of the Fischer Lime and Cement Co., Memphis, reports that the Greenville Stone & Gravel Co., of Greenville, Miss., of which he is an official, is busy but hampered somewhat by car service. A good demand is in evidence for gravel. At Williford, Arkansas, where their crushed stone plant is located, a similar situation prevails as to cars. Mr. Fischer has just returned from Little Rock and says building activities there are good but have been hampered recently by carpenter's strike.

The Waupaca Sand and Gravel Co., main office Waupaca, Wis., operating a large plant at Amherst Junction, Wis., on the Soo Railway main line, has purchased 40 acres of gravel deposits at Binghampton, Wis., located on the Wisconsin & Northern Railway, 12 miles north of Appleton and four miles south of Black Creek. The deposit tests 80 per cent gravel, with 70 per cent passing a 2¼-in. round perforation, the balance being a sharp torpedo sand with a minimum of fines. A large washing and screening plant will be erected and ready for spring shipping.

The Cumberland Sand Co., Manumuskin, N. J., has been rushed with orders regardless of prevailing high prices.

The Batesville Gravel and Material Co., Batesville, Tenn., has applied for amendments to charter for increasing capital stock from $5,000 to $75,000.

The Detroit-Oxford Gravel and Stone Co., Oxford, Mich., are circulating a letter containing the following to their customers: "Cars for gravel are becoming very scarce, due to the fact that the demand for them is great in other lines. You will be able to help in relieving the situation by promptly unloading the cars after placement; and further, by anticipating your ability to unload and not order shipments faster than you are able to unload promptly. There is at the present time a heavy demand for concrete and road materials, and your co-operation in this matter will assist much in helping the other fellow as well as yourself. Let us all be good scouts and do our best to help the situation."

Cement

The United Portland Cement Co. will build a new plant at LaFayette, Ont.

The Allentown Portland Cement Co., Allentown, Pa., has increased its capital stock to $843,375.

The Lava Cement, Clay and Silicate Products Co., Three Rivers, Province of Quebec, is constructing a large plant at that place.

The Canada Cement Co., Ltd., Montreal, Que., which owns a number of plants in Canada, has declared a dividend of 1½ per cent.

The United Portland Cement Co., Brantford, Canada have awarded the contract for their new factory to Alex Buthis Co., of Brantford.

The Bath Portland Cement Co., Newark, N. J., has begun the erection of 20 houses at Bath, Pa., to be used by its employees at the plant at that place.

Suit is being brought against the Copley Cement Manufacturing Co., Copley, Pa., by citizens of that town, to cause it to stop scattering dust over the town.

Contracts have been awarded to three Toronto companies for the construction of the $150,000 potash recovery of the Canada Cement Co., 273 Craight Street, West, Montreal. The plant is to be built at Port Colborne, Ont.

The Alpha Portland Cement Co., Easton, Pa., are issuing for circulation a small, well-illustrated booklet entitled "21 Concrete Suggestions." Twenty-five thousand copies have been printed and the company is willing to supply a reasonable number to live dealers and contractors who will circulate them in their regular mail or to a special mailing list.

C. M. Harrison, real estate man of Sioux Falls, S. D., has been named by Governor Norbeck as one of the members of the state-wide commission which will select a location for the state cement plant provided for at the last session of the legislature. The commission is composed of: Paul Bellamy, Hardingrove, Frank H. Barnard, Aberdeen and W. J. Sharwood, of Lead. The latter is the chief chemist of the Homestake mine in the Black Hills. The commission is headed by the governor and is subject to meet at his call for the purpose of looking over proposed sites for the plant, discussing the merits of each and determining finally where it shall be established. Three possible sites for the cement plant owned by the State have been considered at all feasible, at Yankton, at Chamberlain, and at Pierre. At all three of these places desirable clay is available in large quantities. When the plant at Yankton was closed down some ten years ago Mr. Harrison was one of those who made an investigation of the plant and the cement situation, and it is probably due to his familiarity with the subject that he was selected by the governor.

Retail Dealers

The Wausau Concrete Co., Wausau, Wis., capital stock $25,000, to deal in building materials. Incorporators are J. A. Miller, I. J. Westerveld and C. W. Parson.

The Fall Creek Farmers Grain and Products Co., Fall Creek, Wis., has increased its capital from $10,000 to $25,000. This company deals in cement and building materials.

The Froedtert-Feldman Coal and Supply Co., North Milwaukee, Wis., has been incorporated with a capital of $25,000 to deal in building materials. The incorporators are W. Freele, T. Shaf and E. De Groot, all of Wausaukee, Wis.

Gypsum Products

The Manitoba Gypsum Co., Winnipeg, Canada, has started the construction of 25 houses on land adjacent to its mill, which will be rented to employees.

The Hercules Plaster Board Co., which now operates a large plant at Hampton, expects to be housed in a new factory to be built at Money Point on the Norfolk side of Hampton Roads by spring. The new plant will have a capacity 20 times as great as that of which the present factory at Hampton is capable. The amount of money to be expended by the company in the change is estimated at from $55,000 to $100,000.

Lime

The Manitoba Gypsum Co., Winnipeg, Canada, are making an addition to their plant. The contract for the 3-story, mill-construction building has been awarded to the Frank S. Jennings Co.

The Goose Creek Lime Works, Middlebury, Va., has discontinued the manufacturing of all grades of burned lime, and are now using the whole of their plant for the production of pulverized limestone.

A branch of the Illinois Experiment Station, University of Illinois, has been established at a point eight miles northwest of White Hall, Ill. It occupies about 15 acres of orchard property on the McClay farm, a tract that has a total of 600 apple trees. The principle experiment being carried out is to determine the value of lime as an orchard fertilizer. Various trees are being given this treatment in different amounts to determine the best proportion.

The Waukesha Lime and Stone Co., Waukesha, Wis., through its soils department, is giving to the farmers of that State some very complete and well biased advice as to the use of lime and limestone. Better than argument, convincing evidence by way of actual results, are depicted. Limestone is featured as the key to the padlock which secures the gate across the road of prosperity. By its use the gate may be opened and increased production obtained.

The Provincial Lime Co., Lawlor's Lake, New Brunswick, has a large crew of men engaged in rebuilding in reinforced concrete and steel, the lime manufacturing plant which was destroyed by fire. The debris has been cleared away and the concrete walls are being raised rapidly. The new plant will be completed this year. It will be up to the minute in every detail of construction and installation and will no doubt be more efficient than the old plant, which had a capacity of 10,000 tons of lime per year. The outstanding feature of the construction of the new plant is that it will be absolutely fireproof.

Passed By The Screens

Personals

H. C. Shields, who has been in charge of the Chicago office, as Western sales engineer of the Fuller Engineering and Fuller-Lehigh Companies, has resigned to become Vice-President and General Manager of the Arkansas Portland Cement Co., a new Arkansas corporation.

Major C. E. Smith, recently with the Construction Division of the Army, has resumed management of the C. E. Smith and Co., Consulting Engineers, general offices at St. Louis. W. D. Hudson, formerly Assistant Bridge Engineer, Missouri Pacific System, and G. H. Packwood, Jr., formerly Electrical Engineer, City of St. Louis, have become associated with the company.

Quarries

The Ohio Valley Stone Co., Evansville, Ind., has filed preliminary papers of dissolution.

The France Stone Co., Toledo, Ohio, has sold a small tract of land in Monroe, Mich., to George M. Huffman.

The contract for storage bins, towers, etc., for the Canada Crushed Stone Corporation, Dundas, Ont., has been let to F. F. Fry, 1038 College Street, Toronto.

W. R. Saxby, who owns three quarries near Alton, Ill., has purchased the Litchfield Marble and Granite Co. property on the east side of the square in Belleville, Ill.

Several Bankers in Henderson, Ky., are buying ground limestone in carload lots and selling it by the ton at cost to the farmers.

The North Texas Stone Co., Chico, Texas, has obtained a year's contract to furnish stone for highway work for the county of Dallas, Texas, at a price of $1.10 to $1.25 per ton, f. o. b. the plant.

The Dean & Brown Quarry Co., Coos River, Ore., have been having considerable trouble in obtaining labor. As a last resort it has been necessary to again raise the present wage scale from $4.50 per day to $5.00 per day.

An order made by the court restrains the Lake Erie Limestone Co. at Hillsville from blasting on or near the property of William Gilmore that stone will fall upon the Gilmore property or that his buildings will be damaged. This order replaces the original one halting operations of the company near the Gilmore property.

The Lehigh Stone Co., Kankakee, Ill., is at the height of its production season. One of the big uses of its output is for agricultural limestone, and the plant is operating day and night to meet the Illinois farmers' needs. The large road work of northern Illinois is also taking considerable of the larger sizes.

The Olivine Co. of Milwaukee has purchased the Marquette city quarry, the stone crushing plant and the leases from the Marquette Trap Rock Co., and will assume ownership on January 1, 1920. Edward Copps of Milwaukee, general manager, secretary and treasurer of the company, has announced that the products and tonnage of the plant will be increased. A new plant to manufacture products of the quarry is contemplated to be builded at North Milwaukee.

J. A. Green of Council Bluffs, Ia., has obtained a lease of the old East Sioux Falls quarries, from the owner, Mrs. R. H. Warren, and work on a small scale will start immediately, gradually growing this fall with new improvements which are to be made so that a large output of from 25 to 30 carloads of crushed rock will be produced daily this coming spring. The large amount of municipal paving and road work in Minnehaha County planned for next year will take the greater share of the output.

Heretofore the output of the quarries consisted almost solely of cut rock which has gained quite a reputation in South Dakota for its building qualities, but in which there no longer is any profit. The old hotel and about 10 cottages which are located near the quarries have also been taken over and will be used to house employes. A temporary outfit will be installed immediately which will be able to take care of the present demands. The new concern will employ about 30 men.

The Dell Rapids rock crushing quarries', Sioux Falls, S. D., miniature strike is now in a fair way to settlement and by the first of the week shipments will be under way. The Wisconsin quarries at Sioux Falls, whose men also quit work, are now again getting back to the normal output. During the past few days men from Chicago have been looking over prospective deposits of jasper granite at East Sioux Falls, Rowena and Garretson for the purpose of deciding on suitable location for stone crushers.

The East Sioux Falls Quarry has been purchased by Mr. Green of Council Bluff, Ia., and will be put into operation. At present but little is being done, but the plant is gradually being enlarged. By spring it is reported that the maximum output will be about 30 cars per day. The main output of the plant will be consumed in the big Iowa road building program to be carried on next year.

Every producer of rock products in St. Louis will have to have his name and the address of the quarries or plants operated by him painted in letters three inches high on every commercial vehicle used by the company. If every painter in St. Louis were employed every day for seven days a week for the sole purpose of painting names on the vehicles in St. Louis the job would not be finished for three months, city officials have found, so the period of time allowed to do this has been extended.

Work was stopped for two days recently at the quarry of the Perkinson Construction Co. in St. Louis, when the hoisting machinery was put out of commission by the explosion of 36 percussion caps and a quantity of black powder which was being carried by a workman at the quarry. In transferring the explosive from the powder house across the quarry, one of the caps was dropped at a point near the hoist and its explosion set off the rest of the caps and the powder. The workman died several hours later in the City Hospital.

The Sioux Falls Granite Co., Sioux City, S. D., report the shortage of railroad cars as rather critical to business. The main trouble does not seem to be in the number of cars available for from all indications there is surely a big supply of cars. Numbers of cars are seen on the sidings about Sioux Falls, but they are not moved. The trouble is reported to be more with operation than with the supply of cars. It is said that three carloads of material were shipped into that city and then left on siding for three days

Construction work has begun on the new $20,000 silica manufacturing plant of the Parker Russell Mining and Manufacturing Co. of St. Louis, which was recently destroyed by fire. Although the entire silica manufacturing department of the company was put out of order by the blaze, there was no let up in the work, the manufacturing being done in another department of the company's plant. The fire, which destroyed parts of other buildings of the company's plant, started in an abandoned elevator shaft of the silica plant, and spread to other buildings. According to President Parker, of the company, occupancy of the new plant will be made immediately after construction has been completed.

The International Pulp Stone Co., East Liverpool, Ohio, are being sued for $1,600 damage done to the property of J. Williamson, whose lot is directly adjoining the company's holding. Williamson claims that he granted a right of way to the stone company across his lot, with the understanding that the roadway was to be kept in good condition. He alleges the road has sunk to a depth of five feet or more, making it impossible for him to get in or out, and that the company has refused to fill it up and keep it in condition. It is further claimed that the blasting done by the company has caused damage.

The Farmers' Co-operative Limestone Co., Branchville, Calif., has been capitalized at $10,000. The shares have a par value of $50 and were offered only to farmers, no one being allowed more than two shares. A committee selected the site for the crusher and the source of rock, drew up plans for incorporating, and attended to all other details. Contracts for machinery and buildings to cost $4,600 have been let. The plant will have a capacity of three tons an hour and will be provided with a storage bin of 500 tons capacity. A ledge of rock has been leased for 49 years at a royalty of 7½ cents a ton, and it is expected that limestone will be sold for less than $3 a ton.

George T. Broth, Gladstone, N. J., is building a large crushing plant on his farm near that place. The farm, which covers 220 acres, was found to have a large deposit of limestone which could be easily mined and will be useful for crushed rock and agricultural limestone and lime. At present Mr. Broth is busy erecting a crushing plant which will have one large crusher and pulverizing machinery to produce the agricultural limestone. Later, when the industry is better organized and under way, lime kilns will be added to the plant. Just at present it is not definitely known what size the plant will be. Owing to the road building program and the building prospects it is believed that business will be good in New Jersey, and as soon as possible the plant will be under way.

The St. Louis Eastern District Freight Traffic Committee recently held hearing on a number of new dockets concerning rate changes on rock products. Docket 601 concerned rates on stone, viz., fluxing stone, grout, spalls, sugar stone, waste stone, odds and ends, minimum weight 90 per cent of marked capacity of car, from points in Indiana in the same classification as Thornton, Ind., to Muncie, Ind. The present rate is 8 cents per 100 pounds; proposed rate is 7 cents per 100 pounds. The Chicago, Indianapolis & Louisville Railway, in their petition for change, argue that the present rate is on an improper basis, being higher than present rates on ground limestone, a commodity having greater value. Docket 610 concerned rates on agricultural limestone, carload, from Marengo and Milltown, Ind., to all points in Indiana on the Southern Railroad. The proposed rates average a 50 per cent reduction over the present rates.

The Geneva Limestone Co., Oak Corners, N. Y., is planning to increase its present capacity from 500 tons per day to 1,500 tons per day, according to a newspaper report. This increase will necessitate the installation of a 42-in. by 48-in. jaw crusher and other machinery necessary to supply this crusher. The outlook for the stone business is very bright and the new crusher will be installed so that later machinery of the same type can be added, thus bringing the capacity of the plant to 3,000 tons per day. Charles Hutchins, who has had charge of the Brayer Bros. quarry plant at Auburn, N. Y., for the past 16 years, has taken over the management of the Geneva plant. After the additions have been made, it is estimated that the gross business of the company for a year will be in the neighborhood of a quarter of a million dollars and that it will employ about 30 men with an average payroll of $1,000 per week.
before being spotted so that the contents could be removed.

Manufacturers

The Walter A. Zelnicker Supply Co., St. Louis, Mo., is circulating bulletin No. 270, which covers very completely the company's stock of used and new machinery and supplies. The company presents a varied supply of new machines built at their factories, and also an extensive stock of used locomotive machinery and contractors' equipment.

The Bucyrus Co., general office at South Milwaukee, Wis., has moved its southern sales office from New Orleans, where it has been for a number of years, to Birmingham, Ala., room 2212 Jefferson County Bank Building. C. N. Ballentime will remain southern sales manager and will be assisted by E. J. Wilkie, who for many years has been connected with the sales department at South Milwaukee.

The C. E. Smith & Co., Consulting Engineers, make the following announcements: A Chicago office at 1313 Steger Building has been opened in charge of W. C. Curd, who has been engaged for many years in general railroad work, also as Drainage and Water Service Engineer for the Missouri Pacific System and with Layne and Bowler Co., and William Graver Tank Works, on Water Supply and Purification. He will give special attention to Water Supply, River Protection and Drainage.

The Allis Chalmers Manufacturing Co., Milwaukee, Wis., are circulating bulletin No. 1411 on "Modern Rock Crushing Plants" and bulletin No. 1454 on "Dust Collectors." Modern Rock Crushing Plants is a well illustrated pamphlet giving good argument as to the performance of the companies, ore breakers, revolving screens, elevators, hoists and other machines used in the crushing industry. Sectional elevations of a number of plants at present in operation are also included. The Dust Collector bulletin is of the same high quality and purpose and presents the company's method of elimination of dust in the design of plants to manufacture or produce material with much fines in it.